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Mechanizing the Farm: A Prophecy

How a Revolution in Agricultural Methods Is Taking Place and What It Holds in Store for the Metal Trades

BY PRENTICE WINCHELL

I

YOU are driving down a country road one sunny morning in 1950. You stop beside a prosperous farmhouse and clamber out in search of water for the radiator's innards.

Behind the house is a huge steel shed similar to a hangar—but there are no fragile planes in that shed; only a dozen huge-wheeled, snub-nosed machines which would find it hard to leave the ground save under the persuasive influence of a hoist.

You approach one of the overalled mechanics who is busy with a spanner tightening various parts of a tractor.

"Where's the farmer?"

"I'm the farmer," replies he of the wrench. "What can I do for you?"

Back in 1925 you might have been surprised to find a son of the soil looking like a machinist, but in 1950 you are not astonished. The machinist has come to the farm to stay. Farming is a mechanical industry in 1950.

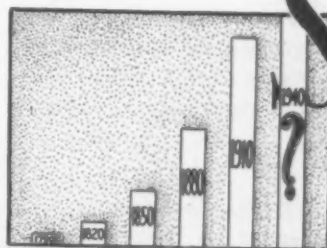
II

IF you think that such a view of the future is exaggerated, recall the changes which have taken place in the last two generations. Sixty years ago the power for farms was furnished by animals. Horses and mules and oxen still help the farmer. But their proportion of the total power used on farms is less each year. Today more than half the primary power on our farms is mechanical. The beast of burden requires a machinist more often than a veterinary.

Farms use more power than all our mines and factories. And in two short generations, more than half this enormous transformation has been effected. Nor does it stop at the power phase of agriculture. From hay stackers to potato-diggers, the whole field of agriculture is being revolutionized—mechanized. In 1850 the production of agricultural implements was less than \$7,000,000. Last year the output of farm machinery, including tractors, passed the \$300,000,000 mark.

But this is only a beginning. Rapid as has been the growth in use of mechanical aids for food production, such applications in the future will be even more rapid. There are many reasons for this.

III



Population in the United States doubles about every thirty years. What will it be in 1940? 1970?

STRONGEST of many reasons is the growth of population. Economists say that population tends to double about every 25 to 30 years. Statistics show that this is close to the facts in the United States. If the present trend is maintained—and there is no reason to suppose it will not be—the United States will have to supply food

for some 175,000,000 people in 1950—perhaps many millions more.

Nor is there any reason to suppose that new territory will be added to our possessions in any such ratio as the increase in population. Our population per square mile has been doubling about every 40 years. This simply means that more food will have to come from every acre.

Now it is a well-understood fact that the more food which must be grown on any given area of land, the more labor in proportion is required to produce it. The best and richest land is used first, naturally. As the need for more and more food brings into use the less productive land, more work is needed to grow the bushel of potatoes or the peck of peas.

Under these circumstances, rapidly growing population, need for increased food production and an accelerating cost of production, it will be seen that not only would more labor be needed on the farms, but food

would cost more and living costs in general would advance.

All of these things would undoubtedly have their effect today were it not for the improvements in agricultural methods, and particularly, the increased use of machinery. And as these factors become more pressing, the need for improved machinery on the farm will become more evident and many farmers, who now hesitate about purchasing an expensive piece of equipment on grounds of cost, will find that the territory which economists call "marginal utility" has been crossed and that the new equipment is a necessity.

IV

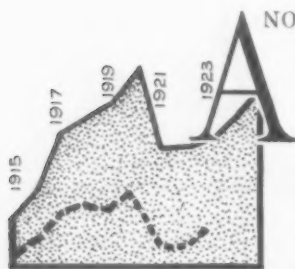
WHAT machinery has done for the farmer is best shown by the productivity of the individual farm hand. Sixty-five years ago 100 average farm workers produced enough to feed 651 people. In 1910 these same 100 workers were enabled, by the use of machinery (and improved methods made possible by machinery) to produce enough food for 727 people. And in 1920 the same 100 workers fed 966 hungry mouths.

Nearly 2,000,000 less workers were required on our farms in 1920 than ten years earlier.

Thus machinery is making possible a reduction in the working forces on our farms, despite the increased demands upon them. And it is very possible that the unwillingness of young men to do heavy drudgery on farms has had something to do with high cost of farm labor and consequently with the introduction of machinery. Certain it is that, with the growth of population, the enormous increase in demand for food and the reluctance of labor to do the old type of farm work, machinery offers the only solution.

Moreover, as more food is required, more land must be used to produce it. With every increase in area cultivated, the efficiency of machine farming becomes more evident. Less than one-fifth of the land area of this country is now under cultivation, according to Government estimates. Some say that the day will come when nearly half our land will be used for agriculture—but if the increase is very much less than that, an expansion in the use of farm machinery will surely follow.

V



Exports of farm machinery are growing, too. Top line, total equipment exported, including tractors; dotted line, exports of tractors alone

ANOTHER factor which has retarded the sale of farm equipment has been the difficulty of adapting present implements to machine use.

Many a manufacturer clings to obsolete equipment because he does not know how to get any value out of it through sale or adaptation and because he thinks he cannot afford to throw away that much money. The farmer has made the same mistake concerning his implements.

A recent bulletin of the Department of Agriculture pointed out that most farm implements intended for field work were originally designed for the use of animal power. When tractors came into use for field work, they were easily adapted to the majority of the operations required for non-row crops, but for row crops there have been difficulties which meant the designing of new equipment. Each year sees newly designed implements for use with tractors; each year

sees many of the old implements worn out or discarded. The use of machinery is increased thereby.

Another factor is the changing in training of the farmer. Our agricultural schools and colleges are turning out thousands of tomorrow's farmers who are believers in mechanizing the farm. Many of them will design and invent new applications of power to the cultivation of the soil, planting of crops, harvesting, storing and transporting of grain and all the duties which formerly took man or horse power.

Still another reason for expecting increased sales of farm equipment is the competition which our farmers have to face from cheap food products grown abroad. More efficient production will help to offset this disadvantage in the world markets.

VI

WHAT is true of the United States in particular is true of the rest of the world in general. So far as plentiful food supplies for a steadily increasing population are concerned, there is but one solution, a growing use of farm machinery, milking machines, seeders, huskers, the thousand and one items of farm machinery plus the appliances which are necessary to keep such equipment in good running order. Therefore manufacturers of such machines and appliances may and do expect a continual gain in demand for their products. Is there any reasonable way of determining how much of an increase may be anticipated during a given period?

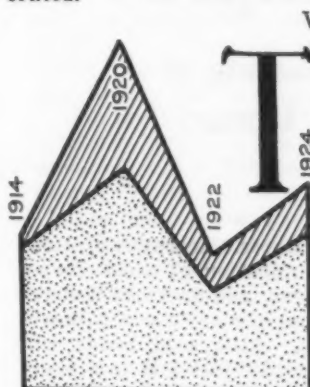
There is a direct relation between the number of mouths to be fed and the amount of food required. Quality or variety of food products might conceivably change considerably, but quantity could not be reduced per person without immediate and serious results. There may be many who eat overmuch—but there are also some who are not properly fed. The quantity of food consumed in the United States (regardless of exports or imports) might well be expected to double every 30 years.

What are the facts in regard to value of actual production? From 1890 to 1920 the total wealth produced by farms (crops, livestock, dairy products, etc., but not including gain in value of farm property) showed a distinct tendency to double every decade. If prices were constant, and exports and imports were eliminated, the tendency would presumably be to double once every 30 years. But price increases, large exports and growth of consumption combined to give a total farm production in 1890 of about \$2,500,000,000; 1900, \$5,000,000,000; 1910, \$9,000,000,000, and 1920, \$18,000,000,000. (All figures approximate.)

How much machinery is employed to produce this enormous wealth? The Department of Commerce lists the total value of all farm implements and machinery on farms in 1890 as \$494,000,000. Ten years later, when food production had doubled, the value of implements and machinery had advanced to \$749,000,000—about a 50 per cent increase. After another decade, the value of such equipment was estimated at \$1,265,000,000—this time more than a 50 per cent increase. And during the last decade in question, the value of implements and machinery on farms jumped to \$3,594,000,000—not far from three times the value in previous years.

Difference in price levels, errors of computation and lack of comparable data may all be brought into the problem to justify any discrepancies which appear, but the fact remains that in recent years the gain in value of machinery employed on farms has been more rapid than formerly. This bears out the contention previously made, that as population increases and food

becomes increasingly difficult to produce, the application of machinery to farming will be steadily accelerated.



Total production of farm implements, dotted area. Output of tractors, lined area. The trend is clearly upward despite the drop after the unusual business of 1920.

VII
THERE is another element which enters into the future of farm machinery and those who produce the raw materials for it as well as those who actually manufacture the implements. This is the element which, overlooked for many years by the automobile business, is now the mainstay of that industry. We refer to replacements. It is well known that a very large proportion of the total business in automobiles is now traced to replacement orders.

Farm implements and machines also have to be replaced, of course. Manufacturers have been getting replacement orders for many years. But with every increase in total value of farm implements in use, the total annual replacement business must show a corresponding gain. Fifteen years ago, when the entire

valuation of such machinery in use on farms was \$1,265,000,000, replacement business was, perhaps, not such an important item. Today, when new machines are being placed on the market every month, when graduates of agricultural colleges apply scientific methods to the old farm, and when the total value of farm equipment must be well above the \$4,000,000,000 mark, the replacement business is of much more importance.

Twenty-five years from now, if population is double that of 1920, when food production will have increased proportionately (possibly exports may drop and imports increase) when the total value of farm implements climbs toward the \$10,000,000,000 mark, then the replacement business will presumably dominate the implement industry as it does the automotive industry today in the domestic market.

Those who were astonished at the continual acceleration of automobile production will probably be astonished again by the great strides which the agricultural machinery business will make in the next decade or two. But those who look at the figures concerning population, food, farm labor and the use of implements will not be surprised.

As the age of hand production of industrial articles has largely given way to the machine production of commodities, so will the planting and growing and harvesting of food become a machine, rather than a hand, industry. The old order changeth before our eyes.



Compressed Gas Manufacturers to Meet in January

The Compressed Gas Manufacturers' Association will hold its thirteenth annual meeting on Jan. 25, 1926, at the Hotel Astor, New York. The association represents manufacturers of all industrial gases, such as acetylene, ammonia, carbonic gas, chlorine, hydrogen, nitrous oxide, nitrogen, oxygen, sulphur dioxide and various hydrocarbon gases. These gases are used for isolated lighting and heating plants, in the fabrication of metal by means of the welding and cutting torch, for mechanical refrigeration, for carbonation of beverages, for bleaching in the textile and paper industries, in the purification of water and sewage by chlorination, as anaesthetics, in fire extinction, and for various other purposes.

The value of compressed gases consumed in the United States yearly is now estimated as at least \$60,000,000. They are transported under high pressure in steel cylinders or tank cars. About 4,000,000 gas cylinders are in service representing an investment of some \$40,000,000.

The headquarters of the association are at 120 West Forty-second Street, New York, and John H. Luening is secretary.

A dipper dredge is now under construction at the works of the Bucyrus Co., South Milwaukee, Wis. It will be driven through electric motors by Diesel engines of 1200 hp. capacity, the fact that the Diesel engines have been applied being of interest in addition to the size of the dredge.

Steel Treaters' Winter Sectional Meeting at Buffalo

Active preparations are being made by the Buffalo Chapter of the American Society for Steel Treating for the winter sectional meeting which will be held at the Hotel Statler on Thursday and Friday, Jan. 21 and 22. The chairman of the chapter, G. J. Armstrong, has appointed five committees, one on publicity, another on registration, a third on finance, a fourth for the dinner and a fifth on entertainment and arrangements, and they are all actively at work. Some of the metallurgists who will deliver papers are H. J. French, of the Bureau of Standards; Dr. Egeberg, Halcomb Steel Co., Syracuse, N. Y., and E. C. Bain, Union Carbide and Carbon Research Laboratories, Long Island City, N. Y. On the day preceding the opening of the sectional meeting, the first session of the newly elected directors of the national society will be held.

"Concentration in Boilers," a paper read by Grant D. Bradshaw, Andrews-Bradshaw Co., Pittsburgh, before the Engineering Society of Western Pennsylvania, has been reprinted and is being distributed by the company. It deals with treatment of feed water for boiler use, to prevent scaling and other difficulties in operation.

The American Oil Burner Association will hold its next annual convention and exposition at the Book Cadillac Hotel, Detroit, April 6 to 8, 1926. Leod D. Becker, 350 Madison Avenue, New York, is executive secretary.

Machine-Shop Facilities Improve

Progress Summarized in Report Submitted at Meeting of
Mechanical Engineers—Optical Measurements, Design
Fallacies and Gear Problems Discussed

A COMPREHENSIVE report of the progress in shop facilities during the past few years was one of several contributions of the machine-shop practice division of the American Society of Mechanical Engineers to the forty-sixth annual meeting of the society, held in the Engineering Societies Building, New York, Nov. 30-Dec. 4. This report, together with similar progress reports of the other professional divisions of the society, was presented at the general session held Dec. 2, and was read by W. F. Dixon, works manager of the Singer Mfg. Co., Elizabethport, N. J., and chairman of the shop practice division.

The use and advantages of optical measuring instruments, some fallacies in machine design, and a discussion of gear problems were among the subjects taken up at other sessions arranged by the machine-shop practice division.

Progress a Matter of Orderly Development

The improvement in shop facilities was said to have been to a considerable extent a matter of the orderly development of known principles, rather than the discovery of new ones. There are nevertheless exceptions, which are noted in the report.

According to the report, the general tendency has been, quite properly, toward relieving the operator more and more of the burden of tedious hand labor. As new machine tools are substituted for older ones, the operator usually finds that more power and more of his employer's capital have been placed under his control, and that this condition has been accompanied by the capacity for doing more and better work.

To this end, machine-shop machinery is being designed stronger and heavier, and more power is being applied to it. Direct electric-motor drive for machines is coming into greater use, partly as a result of applying more power to the machines and partly because of its facility of control. To a great extent, however, individual-motor drive is popular in spite of more costly installation because it makes possible a cleaner and lighter shop, eliminates overhead works, and permits the placing of machinery to greater advantage. Motor drive is being further developed into unit drive. Several motors are often applied to one machine as this eliminates complicated gear trains and in some cases helps toward more economical construction. Sometimes the base of the machine incloses the motor.

Lubrication is receiving more and more consideration. Pressure and splash feed to all bearings and gears, with filters on the return, are becoming common. The necessity for improved lubrication increases as machinery becomes more complicated, more power is applied, and greater accuracy and longer life are demanded. Some of these latter reasons have turned many machine builders to the use of ball and roller bearings, which are installed quite as often to assure uninterrupted service and freedom from lubrication ills as to save power.

Machine control is another factor which is claiming its share of attention. Hand-cranking of tables, carriages, and slides is being replaced by fast feed movements, controlled by handy levers or push buttons, which save both the time and energy of the operator. Many other labor-conserving devices, such as chucks and clamps, operated mechanically, hydraulically, electrically, or by compressed air, are coming into use and are rapidly superseding those manually operated.

Entire rooms occupied by machines working on cast iron are served by dust-collecting systems which clear and change the air, keep the floors clean, and minimize

the necessity for brushing fixtures. Increasing attention is being given to the elimination of accidents by guarding dangerous mechanisms, and specially trained men are being employed to look for and correct hazardous machines and practices. All-gear heads and single-pulley drives, for example, increase the operator's safety.

Hopper and magazine feeds are becoming common on high-production machines for light and medium-weight parts.

Basic Machine Tools Improved

In lathes, mention might be made of one huge turning machine recently built which swings 300,000 lb. between centers and has eight electric motors and a 36-in. grinding machine built on a carriage for use anywhere along its 45 ft. of working length. The designs of other new lathes include automatic features, multiple-feed slides, and single-pulley drives, and on at least one of these machines the work is fed automatically from a magazine. Planing machines are being provided with power fast traverse, faster cutting and return speeds, and better lubrication.

Milling machines now have stiffer over-arms, fast power table feeds and motors inside the column. The special and manufacturing types have been developed to do a wide variety of work; in some cases they compete with the planer in the job shop, while in others they operate continuously on quantity production. The development of these manufacturing millers has been of prime importance to some industries.

For drilling, we have more rigid machines, higher-speed machines, and more sensitive machines. Multiple-spindle drills (both standard and special) are being built for larger production. If quantities warrant, it is usually possible to secure a machine, made up of semi-standard units, to drill all the holes in a part from almost any direction.

Rapid Progress in Grinding Process

Grinding as a shop process has been developed remarkably during the past few years. One of the most outstanding of these developments is the centerless grinder, the unusual production and precision possibilities of which have opened up wide fields for its use. Improvements on internal grinders extend from an attachment on a universal grinding machine to an almost automatic machine which is self-gaging, self-dressing, and self-feeding. Cylindrical grinders are being made with better bearings, better lubrication, and greater ease of control. Some auto-loading machines have been built for special production. Wide-wheel straight-in grinding has come into favor on some varieties of work. Extremely powerful and accurate surface grinders are now being built. One of these has a 100-hp. drive, while another has an automatic sizing device and is arranged to finish the work in one pass under the wheel. The grinding of threads on taps, gages, hobs, etc., has been a development of recent years, and some progress has been made in the grinding of gears. Disk grinding, which has been developed to a high state of perfection, is an important operation in many industries.

Mechanical lapping has filled a need for greater precision and better finish, and machines have been developed to lap both flat and cylindrical parts with great accuracy and high finish. It is possible by this method to economically produce work which is accurate to fractions of a ten-thousandth part of an inch.

Besides the general classes of machines mentioned,

an endless variety of more or less special machines for centering, tapping, milling, threading, polishing, buffing, stamping, etc., is being produced. The increased use of pressed metal, which calls for better and larger presses, has led to the recent development of machines which duplicate automatically blanking and forming dies, iron patterns, molds, and engraved work.

To facilitate jig and fixture work there are now available precision boring machines which take the guessing out of this line of work and effect a great saving in cost.

The use of automatic machinery has extended to the heat-treating shop, where various mechanical devices make this phase of manufacture more accurate and economical, and more pleasant for those engaged in it.

Important Developments in Measuring Devices

One of the most important developments has been that of precision measuring. Some time ago we passed from the caliper to the micrometer. Now we are passing from the micrometer to the precision gage block, the sensitive comparator, and light interference as bases for close measurements in the shop. These accurate instruments and tools have gone far toward making real interchangeable manufacture possible at a low cost. With the increasing demand for closer limits in shop work, it is fortunate that a standard of measurement can be referred to which is many times more accurate than is actually required.

Along with the mechanical progress made in machine-shop practice, there has been a corresponding improvement in human relations in the shop. Lighting, ventilation, cleanliness, and safety are planned into modern shop construction. Hospitals are installed to care for those injured and, in addition, to guard the general health of workers. Schools and apprenticeship systems are being highly developed.

Possibilities of Extending Use of Optical Measuring Instruments

AN interesting outline of the use of optical measuring instruments and the possibilities of extending their application in the making of machine parts was given by Henry F. Kurtz, optical engineer, scientific bureau, Bausch & Lomb Optical Co., Rochester, N. Y. Mr. Kurtz's paper, under the subject of "Principles and Advantages of Optical Methods for Measuring Machine Parts," was presented at the machine shop practice session held Dec. 1.

In many cases, said Mr. Kurtz: light, because of its peculiar properties, may be used for making precise measurements of quantities that are entirely beyond the possibilities of the engineer's usual equipment. The increasing demand for accuracy at low cost has led to the design within the last few years of many optical instruments, four types of optical apparatus having been applied to the measuring of machine parts. The field of application of these devices was said, however, to have been barely touched upon.

Interference apparatus, one of the types discussed, was said to have a wide potential field of usefulness for the engineer. The optician has checked the planeness of surfaces and has compared curvatures and sphericities by means of the interference principle for many years, but it is only within the past few years that the engineer has used this method in the making and checking of master gages. With careful work he is now able to compare lengths with certainty to within observed differences of a few millionths of an inch. It was stated that the principle of interference of light can doubtless be extended to many other phases of mechanical work through the construction of suitable apparatus. Such apparatus would not be delicate nor complicated, and would require less skill in use than the ordinary micrometer caliper. The results, it was said, would be a hundred fold more accurate and therefore much more dependable.

Application of the optical lever was briefly discussed, and also imaging systems, by which with the help of lens systems, beams of light may be controlled

in such a manner as to form images of objects. These lens systems may be designed to give an image many times larger than the object itself, the errors of the object being magnified to a high degree and becoming correspondingly easier to observe and to measure. The lens system may be arranged to present the image for inspection in a plane containing a measuring device, for instance a scale, cross-hair micrometer, or a standard templet or contour plate, or an accurately made scale drawing of the object under investigation. One of the most serviceable arrangements is that of the projection system, which is coming into use because of the ease of observation, no eyepiece being required, because large magnifications are easily attained, and because a photographic plate may be inserted in the image plane and a permanent and accurate record made of the conditions under investigation. Among several applications shown by lantern slides was a microscope arranged for setting the cutting tool in a machine, the tool being set in a few minutes to an accuracy of about 0.001 in. Previous to the adoption of this method the tool could be set only by trial and error, at the expense of $\frac{1}{2}$ hr. in time. Thread tool-setting microscopes were also shown, these devices permitting judging the angle of the tool and its angular position to within a few minutes of arc. A tool maker's microscope used in locating holes in a drill jig was another device of interest, as well as a Goniometer eyepiece for tool makers' microscopes. The latter permits measuring flank angle and angle of "lean" as well as helix angle of screw and also making angular measurements on other machine parts.

Two Optical Projection Types

In optical projection apparatus two types were discussed: 1, Comparators, by means of which the projected image of a thread is compared with a standard outline, and 2, direct measuring apparatus, which does not require a standard of comparison.

An interesting section of the paper was devoted to optical scale reading. Angle measuring tools used by the tool maker are usually provided with scales and verniers divided on steel. The verniers are hard to read for the average mechanic, the lines are coarse and conducive to inaccuracy, and the scales are susceptible to damage by abrasion and corrosion, said Mr. Kurtz. Advantage of magnification has been taken recently in the use of a glass scale, divided to fractions of a degree and a single line index by means of which angles may be estimated to 5 min. of arc. For linear measurements the scale is divided to read fractions of an inch, either by means of a single-line or an eyepiece micrometer. The scale is completely inclosed and protected from abrasion. The elimination of the vernier was stressed as reducing the setting and reading to the lowest terms of simplicity. A caliper made with such a scale was shown, also level protractor and devices for setting a milling machine indexing head. Other illustrations included thickness gages, by means of which thickness of 0.00005 in. may be read with certainty, and a length comparator provided with two micrometer microscopes and capable of measuring to an accuracy of one micron or 1/25,000 in.

In concluding his paper Mr. Kurtz said: "The success of such specially designed optical tools, together with the obvious capabilities and possibilities for further uses of optical apparatus, indicate that much remains to be done before these possibilities are exhausted."

Among those taking part in the discussion were R. E. Flanders, manager Jones & Lamson Machine Co., Springfield, Vt.; G. M. Eaton, chief mechanical engineer Westinghouse Electric & Mfg. Co., East Pittsburgh; W. J. Peets, engineer Singer Mfg. Co., Elizabethport, N. J.; C. W. Keuffel, Keuffel & Esser Co., New York, and D. R. Miller and H. W. Bearce, Bureau of Standards, Washington.

Another paper at the same session was on "The Tension Ratio and Transmissive Power of Belts," presented by C. A. Norman, professor of machine design, Ohio State University. The paper gives in the form of curves the results of an investigation on rubber,

leather and fabric belts, conclusions drawn from the tests being given also.

Loose Thinking in Design and Use of Engineering Products

THE methods of the engineer in solving problems arising in the design of machinery, as contrasted with those who substitute guess work for analysis and chance for judgment, were outlined in a paper on "The Question Mark in Machine Design," by Forrest E. Cardullo, chief engineer, G. A. Gray Co., Cincinnati. The paper, which was read by A. L. Jenkins, professor of mechanical engineering, University of Cincinnati, Cincinnati, at a second session held Dec. 2 under the auspices of the machine shop practice division, dealt also with the effects of loose thinking in the erection and use of engineering products.

The attitude of the average machinery user on the subject of foundations and on the method of attaching machinery to foundations was said to give some machinery builders a great deal of trouble. Machine frames, it was pointed out, are of two types: Those which have inherent rigidity and so have need of support at three points only; and those without inherent rigidity, which must be supported at intervals in order to maintain their form and maintain alignment. Attempts to confer rigidity on machines of the latter type by bolting or grouting them firmly to a foundation were said to be fatal to the satisfactory use of planers, lathes and machines of that type. The bed of such a machine should be set on a good foundation, and supported on suitable wedges or other leveling devices at intervals of 3 to 5 ft. Many shop men, said Mr. Cardullo, assume that a foundation will remain true, and that if a machine bed without inherent rigidity be grouted to the foundation, it will add to the stiffness and strength of the bed and eliminate vibration. Foundations sometimes settle from $\frac{1}{4}$ to $\frac{1}{2}$ in., a case being cited where planer beds were forcibly sprung over $\frac{1}{4}$ in., by being firmly grouted to a foundation which had settled.

Of the three types of foundations, rock-supported, pile-supported, and floating, the rock-supported foundation was said to be the best machine foundation, if obtainable at reasonable cost. But even this type is subject to some seasonable movement, and long beds or frames must not be grouted or bolted to it. Where the foundation cannot be carried down to rock, it may be laid upon piles, columns or beams which are rock-supported, such a foundation being less subject to seasonal movement, but more likely to settle at points where it carries concentrated loads.

Supporting Power of Floating Foundations

The floating foundation, which is one laid on an ordinary earth surface and which has been properly leveled and compacted, must be stiff enough to transmit the load equally to all parts of the surface. It must also be large enough so that the distributed load does not exceed the safe bearing power of the earth. It is usually in the form of a properly designed reinforced-concrete slab. It was said that many persons mistakenly imagine that the supporting power of a floating foundation is proportional to its depth, and spend money unnecessarily for excavation and concrete, or, worse yet, erect machinery on floating piers. It was pointed out that even a good floating foundation may settle and provision must be made for keeping the machinery level. If the foundation carries only fixed weights, it can support a number of machines with only slight seasonal changes and very little settling. If, however, the loading varies from time to time, as for instance, if a slab supports a column supporting a traveling crane, independent slabs should be provided for machines without inherent rigidity, while a common slab will do for a number of machines whose frames have inherent rigidity.

When a floating foundation is laid near a pile or rock-supported foundation, many masons think that they add to the rigidity and supporting power of the floating foundation by anchoring it at this point to the pile or rock-supported foundation. As a matter of fact, said Mr. Cardullo, the foundation is then not so

good as it would be if it were free from such support. It was pointed out that in this case, if the earth settles even slightly, the foundation will no longer be true; while if the rock-foundation be subject to moving loads, the floating slab will vary continually in its level.

False Impressions Relating to Bearings

A great deal of misinformation and false impressions were said to be current with regard to the design and use of bearings. The best bearing, where possible to use it, was said to be a perfectly cylindrical hole, the hole being larger than the shaft by an amount sufficient to permit an oil film of proper thickness. One of the things which is often done wrong is to "scrape in" or "fit" a bearing, "scraping in" being spoken of as the old-fashioned mechanical method of making a hole of the same size as the shaft. Therefore a bearing that has been scraped-in has no room between the shaft and box for an oil film. Half boxes were said to be often necessary in order to assemble the bearing, but in such a case the two half boxes should be machined to a perfect cylindrical hole and no shims should be used. The use of a "quarter-box" was characterized as a mechanical crime. In addition to being mechanically incorrect, the quarter-box was said to be an expensive form of bearing, and by substituting a properly designed half-box a great deal of bearing trouble will be eliminated. In referring briefly to lubrication and oil grooving, Mr. Cardullo said that the figure eights, criss crosses and complicated systems of reversed spirals with which many bearings are provided, show that their designers are ignorant on these points.

Another case of design error was said to be the open-side or G-frame for punches and similar machines.

Gear Problems Discussed

TWO papers devoted to gear problems were presented at this session, one being on the subject of "Normal Pitch—the Index of Gear Performance," by G. M. Eaton, chief mechanical engineer Westinghouse Electric & Mfg. Co., East Pittsburgh. Mr. Eaton's paper, which was received with interest, outlined certain departures from previously accepted practice, these departures being said to have been found useful in the manufacture of heavy involute gearing, as they ease the performance during the breaking-in stage of operation. The paper shows that improved performance may be obtained by adopting the proper relation between the normal pitches of the driving and driven gears, measured at the point of tooth engagement. A normal pitch indicating device was also described, this device having been improved, however, since the paper was written. The methods outlined were developed and are in commercial use at the R. D. Nuttall Co., Pittsburgh. They apply particularly to gears for heavy duty, such as those used in heavy traction electric locomotives. The fundamental principles, however, were said to apply to any involute gearing.

Among those discussing Mr. Eaton's paper were R. E. Flanders, manager Jones & Lamson Machine Co., Springfield, Vt.; B. F. Waterman, engineer Brown & Sharpe Mfg. Co., Providence; W. H. Phillips, R. D. Nuttall Co., Pittsburgh; S. Timoshenko, research engineer Westinghouse Electric & Mfg. Co., East Pittsburgh, and H. J. Eberhardt, Newark Gear Cutting Machine Co., Newark, N. J.

The other paper devoted to gear problems dealt with: "Some Comparative Wear Experiments on Cast Iron Gear Teeth," and was contributed jointly by Guido H. Marx, professor of machine design, Lawrence E. Cutter, associate professor of mechanical engineering and B. M. Green, assistant professor of mechanical engineering of Stanford University, Palo Alto, Cal. The gears tested had a face-width of $1\frac{1}{2}$ in., all pinions having 30 teeth and all gears 60 teeth. Three types were included in the test; four-pitch, $14\frac{1}{2}$ deg. involute, standard depth; four-pitch, 20 deg. involute standard depth; and $4/5$ pitch, 2 deg. involute stub-tooth. The test apparatus, which was designed by Professor Cutter, was described, as was also the

method of making the test. Extended data and computations were omitted, and the results of the tests were set forth in the graphical form. Among the deductions indicated by the tests were: The standard depth, 20-deg. involute tooth form appears to be a better one to resist wear than the standard depth, 14½ deg. involute form; the stub-tooth 20 deg. involute tooth form appears to resist wear better than the standard depth 14½ deg. involute form and the standard depth

20 deg. involute tooth form appears to resist wear better than the stub-tooth, 20 deg. involute form.

The paper was read by W. R. Eckart, professor of mechanical engineering, Stanford University and among those discussing it were Wilfred Lewis, president Tabor Mfg. Co., Philadelphia; J. M. Lessells, research department Westinghouse Electric & Mfg. Co., East Pittsburgh, and C. W. Ham, associate professor of machine design University of Illinois, Urbana, Ill.

Smelting Iron Ores

Combustibility of Coke Studied by Bureau of Mines—Use of Manganiferous and Poor Alabama Ores

WASHINGTON, Dec. 8.—With a view to increasing efficiency and lessening costs in the smelting of iron, the Bureau of Mines has attempted to determine the fundamental reactions (as in the combustion of coke) that take place in the interior of the commercial iron blast furnace. It has attacked the problem by two methods, says the report of the bureau for the fiscal year 1925. The two methods are: First, by studying the composition of gases between the tuyere level and the stock line; and second, by studying the composition of stock samples from various levels within the furnace. The investigation is analogous to work that the bureau has conducted with the small experimental furnace at Minneapolis.

In a study of the combustibility of coke a survey was made of the combustion zones of 14 blast furnaces. Gas samples were taken at various intervals across the tuyere planes of commercial furnaces, and the bureau's experimental furnace. Results of sampling at the tuyeres of 14 commercial furnaces, it is stated, show that the combustion of the coke in the hearth takes place in comparatively restricted zones at the nose of each tuyere. The results of sampling in the upper part of the stack of one commercial furnace, says the report, show that the movement of stock in the furnace is toward these combustion zones. It seems evident, it is pointed out, that the movement of stock and the process of reduction in the upper part of the blast furnace are not uniform; near the walls the charge moves faster than in the center of the furnace.

In the blast furnace, the report states, the burning of the coke with pre-heated air at the blast entrance forms a 35 to 65 mixture of carbon monoxide and nitrogen. This gas, forced upward through the furnace, heats the descending ore particles and reduces the iron oxide to metal. At the surface of contact between ore and gas, it is stated, three things happen:

- (1) Heat is transferred from the gas to the solid.
- (2) The iron oxide is reduced through the oxidation of the carbon monoxide.
- (3) The gas pressure drops because of the surface friction. Knowledge of these three phenomena is of fundamental importance, and the North Central station is conducting laboratory experiments relating to them.

"Formulas have been found by which the drop in gas pressure may be calculated for any given value of ore size, temperature, gas flow, and degree of packing," the report says. "Experiments on heat transfer are giving promise. Studies on the rate of ore reduction show that although more than 99 per cent of the carbon monoxide can be oxidized by the ore and the reaction is rapid, the speed of the reaction is affected by the intimacy of contact between gas and ore. A study of these three fundamental reactions will, it is hoped, enable the design and operation of the blast furnace to be less dependent upon rule-of-thumb methods and thereby the iron industry may meet better the increasing necessity of utilizing lower grades of ores and fuels."

Surveys in Alabama are declared to have shown

vast quantities of iron ore that is of a grade too low for making iron under present conditions. The beneficiation of this ore to get a product that can be profitably smelted is being studied by the Southern station. In addition to a large number of small-scale tests, the station made many large-scale tests of samples of red hematite from the Birmingham district. The tests included gravity concentration, magnetic concentration, roasting, and microscopic examination. Good results were obtained from tests of ores from part of the gray iron ore mines in Alabama and a reasonably positive method of concentration was developed, it is stated. Samples of ore from Talladega district are to be tested.

Use of Manganiferous Ores

The report also deals with investigation at the experimental furnace regarding the utilization of manganiferous iron ores. It is declared that steel makers and other users of manganese fully appreciate the lack of domestic reserves of high grade ore for ferromanganese. The primary object of the run of the furnace for a period of 34 days was to determine the feasibility of running a furnace on a 100 per cent charge of Cuyuna range manganiferous iron ores and to ascertain the tonnage, fuel consumption and recovery of manganese which may be expected in the commercial smelting of these ores.

In treating of this subject the report adds, in part:

During the test the composition of the slag was varied over a rather wide range and the effect upon the amount of manganese recovered in the metal was noted. Cuyuna range ores give slags high in alumina and the test showed conclusively that such slags cause operating difficulties unless the basicity ratio of the charge is carefully adjusted to compensate for the alumina. Calculations made indicate that the recovery of manganese and the fuel consumption fall within the range of commercial practice at furnaces making spiegel.

One hundred and thirty-six tons of metal made during the tests is now available for investigating methods of obtaining a product that can be used in the manufacture of ferromanganese.

During the run nearly 900 gas samples were taken from various heights in the furnace. From the more systematic and comprehensive data obtained, it will be possible to follow the reactions taking place within the furnace. As similar data have been taken at a commercial furnace, comparisons can be made between experimental and commercial furnace conditions. Comparison of gas analyses for the two furnaces indicates that interesting conclusions can be drawn concerning the paths of the materials within the furnaces.

A new style concrete board nail is being put on the market by the American Steel Co., Ellwood City, Pa. A double head permits easy pulling of the nail without distortion of the lumber and this makes possible use of both the nails and the wood over again. In this line is also offered a nail that is finding large use in holding the false floor of automobile freight cars. The nail may be removed without destroying car floors.

Sulphur Taken Up from Fuel Gases*

Absorption in the Open-Hearth from German Lignite Briquettes—Effect of Fluorspar and Ferromanganese

SINCE 1923 the Peine rolling mills have used a considerable quantity of lignite briquettes in the rotating-grate producers which supply the gas required for the open-hearth furnaces. At first briquettes with a sulphur content of 3 to 4 per cent were used, and subsequently the briquettes contained 2.4 to 2.8 per cent.

It was not possible to make exact measurements at first, as the sulphur content of the scrap used was not known; and, moreover, owing to irregularity in the delivery of the briquettes it was seldom possible to run for any length of time on a single grade of briquettes. They generally were mixed with a variable proportion of coal so that, for two furnaces which produced 35 to 38 tons per heat, there was one producer operating on coal and four on briquettes.

The sulphur content of the gases was determined quite regularly. The volatile sulphur in the briquettes was taken as being the difference between the total sulphur and the sulphur remaining in the ash. It has been assumed that only the volatile sulphur went off with the gases, the sulphate sulphur remaining behind in the ash; but it is not known for certain whether the sulphur is distributed in this manner, nor whether the incineration as carried out in the laboratory follows the same course as in the producer where moist air is introduced.

Determination of the sulphur contents of the briquettes and of the gas, taken in conjunction with the yield of gas per kilo of fuel, showed that the gas contained considerably more sulphur than would be the case if only the "volatile" sulphur of the lignite had been gasified; while with coal the reverse was true. That this is due to the use of steam rather than to a lag in the composition of the gas when there is a change in the fuel, was shown by the fact that, when no steam was used, the sulphur content of the gases fell to about 78 per cent of its former value. Most of the sulphur in the gases is in the form of hydrogen sulphide, and the presence of steam does not affect the proportion to any considerable extent.

The sulphur content of the gas cannot, therefore, be calculated from the total and volatile sulphur contents of the briquettes, as determined in the laboratory, because: (1) the ash from the producer has not the same composition as the analytical ash, the former containing a certain amount of incompletely burned fuel; (2) the yield of gas per kilo of lignite would have to be determined in each case, as the yield varies with the pitch content of the briquettes. The only accurate

and satisfactory procedure is to make a determination of the sulphur in the gas.

Use of Fluorspar

The harmful action of the sulphur on the steel can be mitigated by the addition of fluorspar. The charge used during the period of the experiments consisted of: Cast iron, 10 to 11 tons; scrap iron, 26 to 28 tons; lime, 1.4 to 1.8 tons; 70 to 80 per cent ferromanganese, 120 to 300 kilos (added at the end) and fluorspar, 45 to 83 kilos per heat. The slag amounted to about 12 per cent of the weight of ingots obtained. The results of 144 heats are given in the table in order of descending sulphur contents of the gas.

The metal was sampled just before adding the ferromanganese. In order to vary the basicity and the manganese content of the slag, heats were also run with variable amounts of lime and of manganiferous substances. A small number of flue gas analyses were made in the case of heats which received no fluorspar. It is difficult to conclude from the results if the metal absorbs more sulphur from the gases during or after fusion; but a previous test had shown this to be the case. When operating a single furnace with a mixture of high-sulphur lignite briquettes and an ordinary grade of coal, the sulphur content of the metal decreased if the use of briquettes was discontinued after the heat was melted, the difference being about 0.01 to 0.02 per cent of sulphur in the ingots.

The additions of ferromanganese and the subsequent reactions in the ladle where the slag is less basic (due to 6 per cent more silica) interfere with the tracing of the sulphur absorption from the gases. In spite of a large number of observations made before the addition of the ferromanganese, before tapping, and while the metal was flowing, no law could be deduced.

General Tendencies Indicated

The following general tendency was indicated: When the sulphur content is high it can be decreased by addition of ferromanganese, but a low sulphur content cannot be further reduced in this manner, the ferromanganese addition in this case being even liable to increase the sulphur. After tapping, the sulphur content in the ladle increases almost regularly, especially in the case of low sulphur, concurrently with re-phosphorization. The only cure for this would be to use a ladle lining highly refractory to heat and chemical action.

Examination of the results of the tests does not reveal any striking difference. For instance, in the heats where no fluorspar was used there does not seem to be any definite relation between the manganese and

*Abridged translation, by A. Papineau-Couture, from an article by A. Jung in *Stahl und Eisen*, vol. 44, 1924, pages 911 to 914.

Table of Sulphur Distribution in the Open-Hearth Furnace

Grams of Sulphur per m. ³ of Gas	Average	S in the Ingot, Per Cent	Average		S in the Ladle Slag, Per Cent	Average, Per Cent	Fluor-spar	Per Heat		
			S, Per Cent	P, Per Cent				Spar, Kilos	Lime, Kilos	Production, Tons
.....	7.12	0.07-0.10	0.083	0.020	.....	0.72	Added	95	1,720	38.0
.....	5.75	0.06-0.09	0.073	0.020	.....	0.68	Added	100	1,740	35.3
4.55-6.59	5.02	0.05-0.07	0.060	0.020	.....	.....	Added	65	1,626	38.5
4.00-6.22	4.80	0.05-0.08	0.061	0.027	0.58-0.84	0.74	Added	83	1,655	36.8
3.78-4.90	4.23	0.05-0.08	0.062	0.026	.....	.....	Added	51	1,560	34.7
2.21-3.45	2.77	0.05-0.07	0.061	0.042	0.30-0.64	0.45	Added	45	1,580	36.2
2.21-3.45	2.77	0.04-0.08	0.059	0.039	0.32-0.54	0.39	None	...	1,563	34.7
1.99-2.84	2.27	0.04-0.07	0.059	0.033	.....	.....	Added	62	1,775	34.8
0.86-1.33	1.23	0.03-0.04	0.033	0.025	0.27-0.50	0.34	Added	70	1,643	32.7
0.86-1.33	1.23	0.04-0.06	0.045	0.042	0.19-0.41	0.32	None	...	1,395	35.5

sulphur contents of the furnace slag, between the silica of the furnace slag and the sulphur in the sample, nor between the silica in the ladle slag and the sulphur in the ingot. High sulphur in both furnace and ladle slags does not correspond to low sulphur in the bath and in the ingot, though the proportions of slag to metal are the same. The relation between high manganese in the ladle slag and low sulphur in the ingot is a little clearer; but it was already known that low sulphur in the ingot was obtained whether or not fluorspar was used, provided the basicity was sufficiently high, the fluidity was right and the phosphorus content of the charge not too high. With insufficient dephosphorization the sulphur content of the ingot decreases even more than under normal conditions, even with a sulphurous gas.

The use of fluorspar in the steel plant has been much debated. The tests described above show that, even though it may not be indispensable with a highly sulphurous gas, it may be considered as an added factor of safety.

Looking at the question from a different standpoint, a thick slag not only interferes with displacement of the sulphur, but it also prevents rapid transmission of the heat of the flame to the bath. Addition of a small quantity of fluorspar removes both of these disadvantages, and it more than compensates the real or pretended damage which it is claimed to cause, viz., increased consumption of dolomite and greater wear of the arches and ladles. On the other hand, the possibility of increase in the sulphur content of the ingot due to wear of the ladle lining remains.

Lime and dolomite are also two possible sources of sulphur. Further irregularities can be brought about by giving the furnace insufficient air, thereby interfering with the conversion of sulphur to manganese sulphide so that a larger amount of sulphur remains in the slag. All these secondary reactions make it more difficult to bring out the effects of the sulphur in the gas on the metal bath. Moreover, the sulphur in the gas is diluted with air, and this fact and the proportion of dilution must be taken into account when comparing different gases.

Conclusions

It is thus seen that when the sulphur content of the gases increases, the sulphur in the ingot also increases, but not proportionately, as the absorbed sulphur is distributed between the bath and the slag. No hard and fast rule can be given; but the difficulty is overcome by adding fluorspar. In the cases which have been considered, for instance, a sulphur content up to 3 grams per cubic meter of gas has practically no effect; above this it is necessary to add fluorspar in order to prevent the sulphur in the ingot increasing above 0.06 per cent. If a sulphur-free product is required, a gas containing not more than 1 gram of sulphur per cubic meter should be used, which can be obtained with a good grade of coal. When the charge is low in sulphur, it is advisable to have sufficient manganese in the slag, to see that there is a sufficient amount of an active slag, and that the ladle lining stands up well to prevent reabsorption of sulphur by the metal in the ladle.

Reasons for Breakage of Mill Rolls

Ten Common Causes Outlined—How Each Is Distinct from the Others

BY WALTER DAWSON*

BREAKAGE of rolls in rolling mills, causing extensive delays, as well as heavy costs for repairs or replacement, are in many cases due to faulty adjustment or use. In the diagram a number of cases are shown, with the causes outlined and suggestions for improvement of conditions, which will obviate the trouble.

A break across the neck at the base of the fillet may be due to two different causes. If the fracture shows clear white, the indication is that the neck is too small. This ties back to the roll designer. If the fracture is blue, the indication is that the break was caused by excessive heating. Fig. 1 illustrates this case.

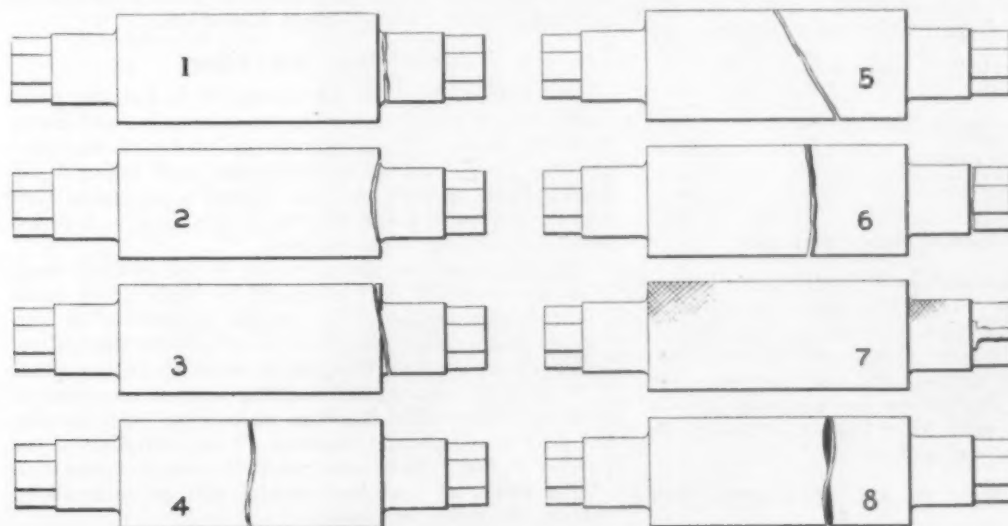
A break at the high diameter of the fillet, as shown in Fig. 2, is usually caused by vibratory stresses set up

in the roll. The remedy indicated is to go over the foundations thoroughly, tighten the foot bolts and the spacer bolts and thus render the mill as free as possible from excessive vibration.

When the housings of the mill are too far apart this condition is almost certain to produce a diagonal break, such as that shown in Fig. 3. The remedy is to bring the housings closer together, so that the bending moment exerted upon the roll will be as small as possible.

A break across the center of the roll usually is due to shock. This is likely to occur from rolling steel which is too cold. Careless operation which permits tongs, scrap and other material to go through the rolls with the steel will bring this about.

Another case of shock is that shown in Fig. 5, where



Ten Types or Methods of Roll Failure Are Covered in These Eight Diagrams, as Outlined Briefly, with Corresponding Numbers, in the Text

*Roll Designer, Gulf States Steel Co., Alabama City, Ala.

the break extends diagonally across the center of the roll. This indicates that the roll is not level.

Fig. 6 shows two sources of breakage. In the one case a break across the middle of the roll, with burnt edges, shows that the roll has been overheated. This means that not enough water has been played upon it during rolling to satisfy its requirements. In the other case shown in Fig. 6, where the wobbler is broken off sharply at the neck, the remedy is to put in a reinforcing radius or fillet.

Checkered surfaces on the roll, as shown in Fig. 7, indicate local overheating. The same is true when checkered surfaces show up on the neck. Another cause of trouble shown in the same figure is a worn wobbler. This condition may be remedied by employing a coupling box true to pattern. The use of an inexpensive grease would be a further help.

Fig. 8 shows a break across the roll, due to a deep fire crack. This form of trouble may be avoided by shutting off the water as soon as the mill stops.

Protecting Patterns With Paints

Some Advantages of an Aluminum Paint Recently Developed—Various Mixtures Compared—Savings Claimed by Their Use

BY J. D. EDWARDS AND R. I. WRAY*

THE proper protection of wood patterns would seem to have become fairly well standardized. However, a new method, with important advantages, has recently been developed by the Aluminum Co. of America.

A pattern should obviously maintain a high uniformity of shape and dimension and should have a durable and smooth surface to which sand will not adhere. Perhaps waterproofing efficiency is the first requisite in a good coating for patterns, since the changes in moisture content of wood are responsible for most of the warping, checking, splitting, etc., which occur. A coating quite impermeable to moisture will therefore minimize these changes. Aluminum paint has high waterproofing efficiency, and has proved effective in preventing warping and checking of wood.

Aluminum-Painted Patterns

It was the idea of T. D. Jolly of the Aluminum Co. of America that aluminum paint would offer many advantages in painting patterns. An extensive test of aluminum-painted patterns was made at the New Kensington plant and it proved so satisfactory that its use has now become standard practice.

The method adopted is first to give the pattern a priming coat of shellac and then sandpaper lightly to give a smooth surface for subsequent coats. Two coats of aluminum paint are then applied using shellac as the vehicle mixed with aluminum bronze powder in the proportion of 2 lb. per gal. of shellac.

A series of measurements was made to determine the waterproofing efficiency of various aluminum paints which might be used for painting patterns. The method employed was that of the United States Forest Products Laboratories and involves comparing the moisture absorbed by bare and painted panels in a 98 per cent saturated atmosphere with that absorbed in a 60 per cent saturated atmosphere. The uncoated wood was assumed to have a moisture-proofing efficiency of zero. Some of the results are given here:

Coating	Waterproofing Efficiency of Various Aluminum Paints	
	Per Cent Efficiency—	
	Two Coats	Three Coats
Aluminum paint in special bronzing liquid	96.5	97.4
Aluminum paint in spar varnish	93.7	95.7
Aluminum paint in orange shellac	73.0	95.7
Aluminum paint in pyroxylin lacquer	82.5	90.0
Orange shellac (without pigment)	13.5	70.5
Bare birch panel	00	00

Various Aluminum Paints Compared

The aluminum paint made with spar varnish gives a coating of fine appearance and of high waterproofing efficiency. It has all the characteristics desirable in a paint for this purpose except that drying is somewhat slow; aluminum paint made with spar varnish may take 18 to 24 hr. to dry before another coat can be applied and somewhat more time than this before the pattern can actually be put into use.

The aluminum paints made with shellac and pyroxylin lacquer are especially advantageous since they dry rapidly. Aluminum paint made with orange shellac will dry in about 15 min. and a second coat can be applied shortly thereafter. It is somewhat easier to secure smooth uniform coatings with paints made with shellac than with pyroxylin lacquer, and since pattern shops are accustomed to use shellac no particular advantage is seen in adopting the pyroxylin lacquer base.

The effect of aluminum powder in increasing the waterproofing efficiency of the coating is clearly seen when the results obtained with orange shellac, with and without aluminum powder, are compared. The orange shellac alone in two coats had a waterproofing efficiency of only 13.5 per cent whereas, with aluminum powder added, its waterproofing efficiency was increased to 73 per cent. In three coats with aluminum powder its waterproofing efficiency was 96 per cent.

Experience has shown that less time need be spent in smoothing up and sanding the pattern, since aluminum paint gives a smoother coat to start with than the use of shellac alone.

Savings in Time and Money

The use of aluminum paint on patterns is both a time and money saver. Patterns which are to be used frequently will require 5 to 7 coats of shellac but can be even more satisfactorily protected with 2 coats of aluminum paint. In a practical test, two patterns were mounted on the same pattern board for use in a molding machine. One pattern was given 5 coats of shellac. The other pattern was given 1 coat of shellac and 2 coats of aluminum paint made with shellac. After making 576 molds the patterns were examined. Although they had both experienced the same usage, the one coated with shellac only was worn very thin and required refinishing. The pattern with aluminum paint seemed to be in just about as good condition as when first used. The economy is obvious.

Sand Does Not Adhere

Another appreciable advantage of aluminum paint is the ease with which the patterns may be withdrawn from the mold. The aluminum painted pattern has a rather "slick" surface to which the sand will not adhere. There is thus actually effected a saving in time and money, since less repairing of the mold is required and less cleaning of the pattern.

In the use of aluminum paint in the pattern shop, it is recommended that the paint be made up in small quantities as needed. The proper proportion of aluminum powder to vehicle is 2 lb. of powder per gallon. A paint in this proportion can be made by taking about 5/16 pint of powder and pouring over it one pint of vehicle (measured in the same measuring-cup), stirring the vehicle and powder together. Long standing of the powder in the vehicle may result in some deterioration of the paint, so that best results will be obtained by making the paint as needed.

*Research Bureau, Aluminum Co. of America, New Kensington, Pa.

BOLT PROBLEMS

Particularly in High-Temperature Work in Power Plants

Bolt problems, particularly those met in power plant construction, were discussed by William P. Wood, assistant professor of metallurgical engineering, University of Michigan, Ann Arbor, before the annual meeting of the American Society of Mechanical Engineers in New York last week.

Professor Wood showed many slides of photomicrographs taken from bolts which have been removed from power plant units in an investigation into the quality of bolts used for that practice. Prefacing his remarks with the statement that heretofore bolts had been pretty much taken for granted, he stated that engineers now are beginning to scrutinize them with some care. His investigation disclosed numerous instances of steel and wrought iron bolts used indiscriminately in different parts of the same job. He found cases also where steel bolts were fitted with wrought iron nuts, and numerous cases where nuts were made of screw stock.

His photomicrographs showed bad slag inclusions in many of the samples which he had observed and considerable irregularity in some of the others. He was emphatically against the practice of using wrought iron where steel was indicated or of using screw stock for this purpose in any case.

In the discussion it was brought out that the 30,000-lb. elastic limit for ordinary carbon steel bolts frequently is approached and often reached in practice. Because of the high steam temperatures in pipe lines, and in other places where the bolts are used, it was recommended that both size and spacing should be so designed that no approach would ever be made to the elastic limit figures. The rapid deterioration in strength of metals at elevated temperatures was given as the reason. It was stated that, under such conditions, it

would be virtually impossible to keep joints tight, because of the permanent set given to bolts when strained beyond the elastic limit.

Another topic which was covered in the discussion was the limitation of the wrench length in setting up the bolt. It was recognized as impracticable to make hard and fast rules on this subject, but certainly the practice of using a wrench of ordinary length and then putting a piece of pipe on the handle to make it longer, and getting two men pulling on the pipe instead of one man on the wrench, should be discontinued.

One speaker reported that a simple way of judging ductility in a nut is to crush the nut under a steam hammer and observe its appearance. Steel of not over 0.30 per cent carbon should be used for bolts. Higher carbons rob the steel of too much of its ductility. The use of a small amount of vanadium was advocated, because of the shocks to which bolts sometimes are subjected. Electric and crucible steel were preferred to both open-hearth and Bessemer, because of the greater uniformity of metal structure.

Another speaker called bolting the weakest part of an installation. The necessity for making the bolt circle as small as possible precludes the use frequently of bolts of adequate size. For this reason alloy steel bolts of a high yield point were advocated, even without their possessing a high ductility. By making the yield point far enough above that of the ordinary carbon steel bolt, the question of superior ductility would not come into play.

Heading of bolts was stated to be a dangerous practice. For this reason the stud bolt was advocated as the safest kind to use.

Other speakers pointed out that, whether bolts after making are air-cooled or quenched in water, all must be annealed alike and then cooled slowly. The size of the grain is governed by annealing at the proper temperature and by a proper speed of cooling. The so-called crystallization reported in so many cases of bolt failures was stated to be really a fatigue or progressive failure.

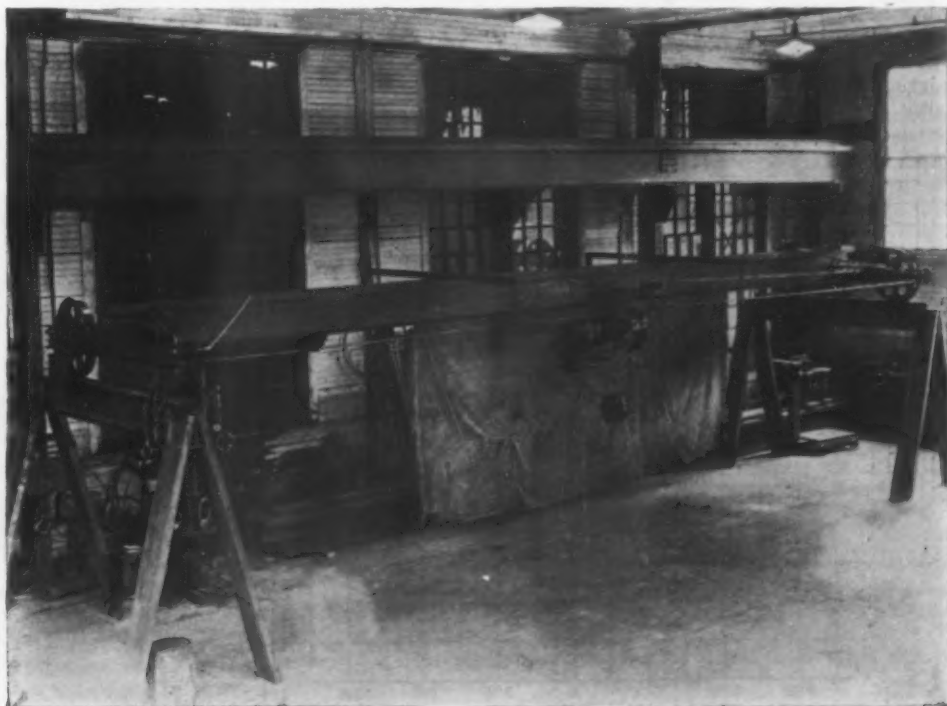
Foundry Bay Crane

Designed especially for ease in operation and for use in side bays of foundries, the Chisholm-Moore Mfg. Co., Cleveland, has brought out a light single-beam traveling crane with a hand-operated bridge. This is built with spans of from 25 to 35 ft. and for handling loads of from 1 to 2 tons. It is furnished either with a hand-power chain hoist or with an electric hoist, the

illustration showing assembly set-up of one of the cranes equipped with an electric hoist.

Features of the crane include its lightness and rigidity. To assure ease in movement it is equipped with large wheels, 23 in. in diameter, mounted in roller bearings. This crane is sufficiently low in cost, it is pointed out, to permit the installation of a crane for every molding machine operator, thereby increasing the efficiency of a foundry.

Lightness and Rigidity Are Features Stressed for the Foundry Bay Crane Shown at Right. The bridge is operated by hand along the single-beam girder. Loads of 1 to 2 tons may be handled, with spans of 25 to 35 ft.



Designing and Making of Springs

Papers Before Engineering Society Deal with Many
Phases—Characteristics Not Thoroughly
Understood—Ring Springs

AS a portion of the annual convention of the American Society of Mechanical Engineers in New York, Nov. 30 to Dec. 4, a session on springs was held in the Engineering Societies Building on the morning of Dec. 2. J. K. Wood, chairman of the research sub-committee on metal springs, presided. Seven papers were read and briefly discussed, dealing with springs and their characteristics in the whole range from the tiny "hair" springs used in electrical measuring instruments to the 300-lb. springs used to support a locomotive boiler upon its frame. The list of papers follows:

"Phosphor-Bronze Helical Springs from the Standpoint of Precision Instruments," by W. G. Brombacher, associate physicist Bureau of Standards, Washington.

"Manufacture of Commercial Steel Helical Springs," by F. H. Brown, superintendent spring factory, American Steel & Wire Co., Worcester, Mass.

"Characteristics of Weighing Springs," by J. W. Rockefeller, Jr., engineer John Chatillon & Sons, New York.

"Springs for Electrical Measuring Instruments," by B. W. St. Clair, standardizing laboratory, General Electric Co., West Lynn, Mass.

"Formulas for Design of Helical Springs of Square or Rectangular Steel," by C. T. Edgerton, Bureau of Statistics, Crucible Steel Co. of America, New York.

"Outline for the Application of Fatigue and Elastic Results to Metal Spring Design," by T. McL. Jasper, special research associate professor of engineering materials, University of Illinois, Urbana.

"Ring Springs," by O. R. Wikander, consulting engineer, Edgewater Steel Co., Pittsburgh.

Phosphor-Bronze Helical Springs

Dr. Brombacher gave results of tests made on phosphor-bronze helical springs investigated at the Bureau of Standards for the purpose of obtaining knowledge useful in the design of springs for precision instruments. The characteristics of the spring material, their method of construction, the apparatus in which the springs were tested and the procedure followed are set forth in the paper. The results relate to stiffness, maximum fiber stress, hysteresis, after effect, drift and buckling.

This investigation was made on behalf of the engineering division of the United States Army Air Service. Nine sets of springs were designed, with wire ranging from No. 18 to No. 8 and with coils of diameter from $\frac{1}{4}$ to $1\frac{1}{4}$ in. Micrometer readings were possible in conjunction with loading of the spring by graduated weights. Deflections were measured by the micrometer head.

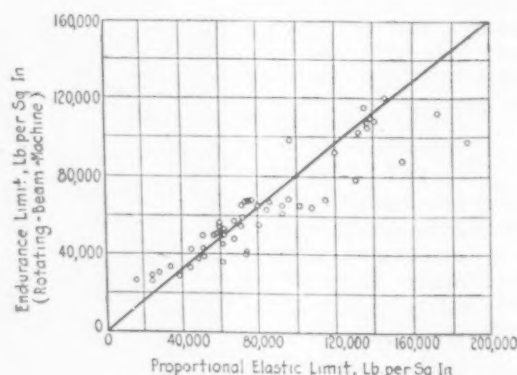
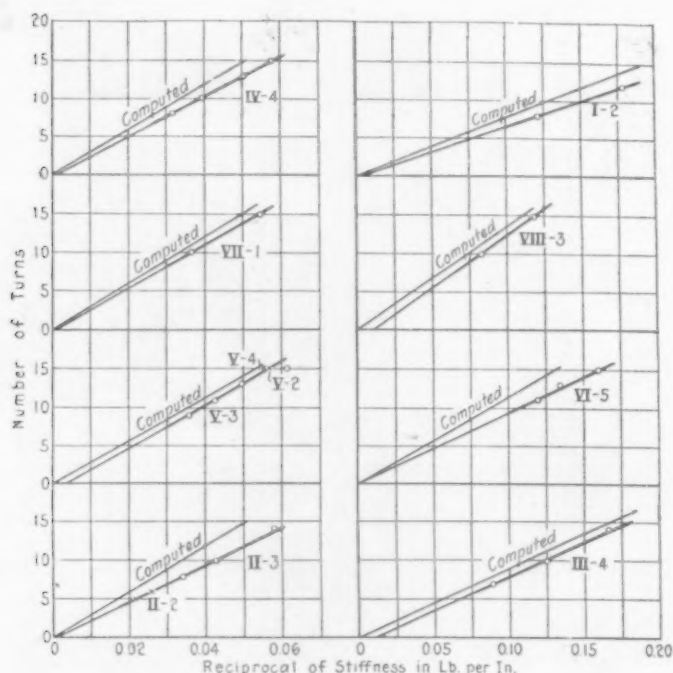
Curves published herewith show the relation between computed and experimental stiffness of a number of the springs tested. It was not found possible to put a limiting value to the maximum fiber stress at the proportional limit, because of buckling of the spring. Straight line load-deflection relations were obtained up to 18,000 lb. per sq. in. maximum fiber stress. All of the springs buckled, even when loaded below the proportional limit. All were tested in compression only.

Mr. Brown's paper dealt with the present status of the art of manufacturing springs of small and medium diameter. The trade requirements and their relation to manufacturing problems were brought out, as well as a consideration of the materials, their selection and methods of test, etc.

Measuring Instrument Springs

In discussing springs for electrical measuring instruments, Mr. St. Clair showed, among other things, how certain compensating elements have to be introduced into the instruments to offset disturbing influences, such as stray electric currents, etc. He dealt both with the mechanical and electrical requirements of the springs and with the conditions affecting their accuracy. So far as fatigue is concerned, he pointed out that repeated operations of springs designed for this service, up to 100,000 cycles or above, need have no greater effect than a single operation, so far as modifying the characteristics and accuracy of the spring are concerned.

Most springs used in this work are of a special phosphor-bronze type. They are not gold plated. As a matter of fact, the makers are exceedingly jealous



Correlation of Endurance Limit
with Proportional Elastic Limit
(Tension)

(At Left) Comparison of Computed and Experimentally Determined Stiffness of Phosphor-Bronze Helical Springs

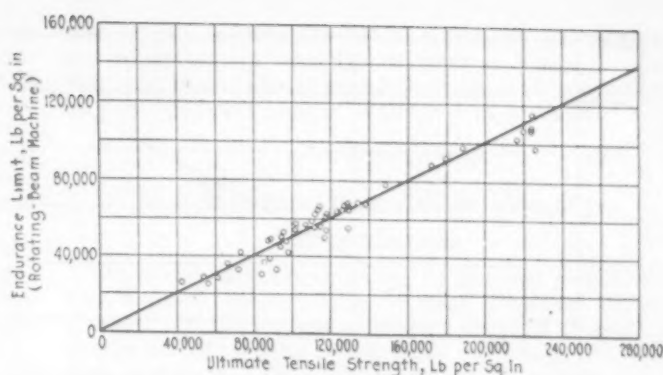
regarding the surfaces of the spring material and no cleaning or surfacing operations of any sort are permitted during manufacture. One point brought out was the fact that rubber-covered wire cannot be used in any part of the instrument, because of the minute but certain operation of the sulphur in the rubber upon the surface of the spring material, forming a copper sulphide and destroying the accuracy of the spring.

Formulas for Helical Springs

Mr. Edgerton's paper dealt with mathematical analyses and design formulas, together with their applications. It was brought out in the discussion that Mr. Edgerton had prepared this paper in 1896, which fact accounts for its not having taken cognizance of a number of papers before technical societies between that day and this.

Although helical springs of square section or rectangular bar steel are not common, problems involving certain extreme requirements are encountered occasionally, which can be met only by such types of springs. The author dwelt upon the lack of formulas for calculating any except springs of square bar steel. He then developed formulas for rectangular steel based upon the work of St. Venant, the French mathematician whose formulas for torsional stress and strain in rectangular and other prisms, by an application of the general theory of elasticity to the case, were first published about 1850.

For the solution of his formulas the author gives tabulated values for two variables which depend on



Correlation of Endurance Limit with Ultimate Strength (Tension)

with some of the wartime needs of the Navy Department. He listed four controlling factors in the design of springs: 1, direct tension or compression; 2, direct shear due to the loading; 3, bending due to the loading; 4, torsion due to the loading.

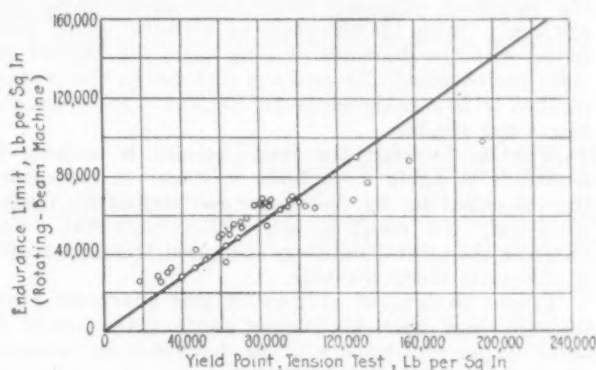
David Landow called attention to several references in which formulas for helical springs had been brought out. Among these he cited his own work of three years ago, as well as articles in *Engineer*, London, of about 15 years ago, and in *Mechanical World*. He stated, however, that text books and handbooks in general take only a single specific case of springs, that with a square cross section.

Fatigue and Elastic Tests of Springs

Professor Jasper's paper (read, in his absence, by J. W. Rockefeller, Jr.) deals particularly with factors of design of metal springs used for shock absorbing purposes and for recuperating machinery. Other uses of springs were pointed out as force measuring or load weighing devices, mechanisms for electrical vibrators, etc., and as a storage of energy or a secondary source of energy in balancing maximums. He divided the problem of the design of springs into two parts: 1, static elastic and fatigue properties of the material to be used in their construction; 2, the shape of the springs, together with the distribution of the stresses developed in their use for a given deformation. In discussing the two points stressed, the author gave results of experimental work carried out at the engineering experiment station at the University of Illinois.

For springs used for load carrying or recuperating purposes the best materials are those capable of developing a broad range of stress without over-straining. Materials are desirable which can absorb large amounts of energy per unit of volume, within their elastic working range. Where deformations are to be repeated many times, this working range of stress should be well below the endurance limit of the material.

In the use of springs in general, stresses vary from approximately zero to a maximum, when any small portion of stressed material is considered. When the metal is repeatedly stressed with reversal it is found that, for steel, the endurance limits in flexure are about 71 per cent of the ultimate tensile strength. As



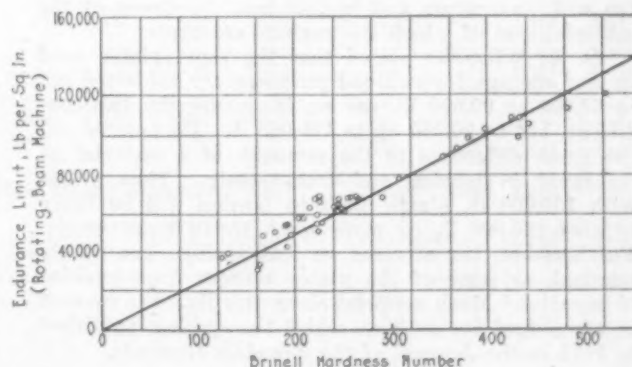
Correlation of Endurance Limit with Yield Point (Tension)

the ratio of the cross sectional dimensions of the bar. An appendix to the paper contains four examples in which the application of the formulas is illustrated. These included a spring of rectangular steel, 1 in. x ½ in., coiled on edge, with a pitch diameter of 4 in. and free length of 10 in.; a rectangular bar spring of 4 in. maximum outside diameter and 2½ in. minimum inside diameter, to carry 1000 lb. at a height of 6 in.; a spring of square steel of 12-in. free length, 6-in. maximum outside diameter, but no inside limit, and to have a scale deflection of 8500 lb. per in.; a safety valve spring of square steel, 5 in. free length, to operate over a valve seat of 2 in. effective diameter with valve closed and 2½ in. with valve opened, the lift at least ⅜ in. and popping pressure 200 lb. per sq. in.

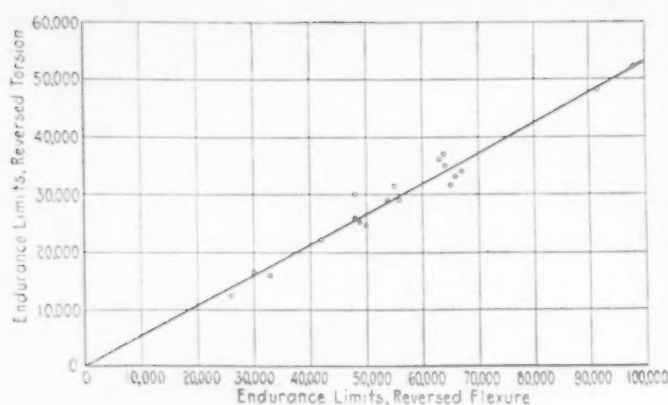
Discussion

In the discussion on this paper S. Timoshenko, engineer, research department, Westinghouse Electric & Mfg. Co., East Pittsburgh, pointed out that the French formulas of 1855 are sufficient to care for all requirements. He stated that these data, in a form suitable for use, appear at page 383 of Fuller & Johnson's book of Applied Mechanics.

William L. DeBaufre, chairman mechanical engineering department, University of Nebraska, Lincoln, spoke of a contribution which he had made to the May, 1917, issue of the *Journal of the American Society of Naval Engineers*, pages 268 to 299 inclusive, in which the French formulas were worked into shape for current use. This was done in connection

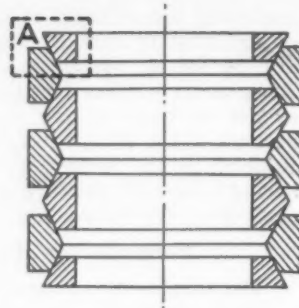


Correlation of Endurance Limit with Brinell Hardness



Relation between Endurance Limits in Torsion and in Flexure for 19 Steels. (Tested in Fatigue of Metals Laboratory, University of Illinois.)

(At Right) Diagrammatic Representation of a Ring Friction Spring of High Stressing Efficiency. The portion inclosed by dotted lines at A is a single element



a basis for design, an allowable unit stress in flexure of 50 per cent of the ultimate strength in tension will give a safety factor of 2.

Discussion

It was asserted in the discussion that in most cases in service there is no complete stress reversal, that is, the stress does not change sign. Therefore the design should be based on the narrow limits within which the spring will operate in service. Endurance tests made with successively decreasing stresses, until the material does not fracture, form a basis for a knowledge of the reliable strength of the material under reversed stresses. Ultimate strength of the material, however, is not reliable as a guide. Curves were shown from tests of several spring materials (alloy steels), three of which had ultimate strengths of about 220,000 lb. per sq. in. Two of these three cases provided an endurance strength of 90,000 lb., while the other gave only 65,000 lb.

H. Campbell, Baldwin Locomotive Works, Philadelphia, expressed the opinion that it is unwise to rely upon small scale tests for large springs. In such cases it is necessary to build a full size spring and test it full size in apparatus capable of handling it. Referring to Professor Jasper's recommendation of using 50 per cent of the ultimate strength, the speaker did not believe that a spring so designed would last long in service.

With particular reference to springs for railroad work, and more especially to those carrying the weight of locomotive boilers or car bodies, he pointed out that the condition is one of a definite static load due to the weight carried, with an increment of 30 to 50 per cent repeated many thousands of times, due to additions to the load and to operation over a roadbed which is not perfectly smooth. Besides this, there is occasionally a very heavy shock load so suddenly applied as to be in the nature of a hammer blow. Consequently, if a spring is designed for 60,000 lb. stress with the static load, this will allow the additional loads to take it up to 90,000 lb., while still giving a good length of service.

Some of the primary troubles of the designer of springs for locomotive use were listed as: inadequate space allowed for the placing of a spring of proper design; loading of springs on too small a length; making springs with too many plates and consequently too stiff; inaccurate and inexact heat treatment of the materials out of which the springs are made.

O. R. Wikander stated that the short plates used in leaf springs for railroad purposes are subjected not to 60,000 or 90,000 lb. per sq. in., under the two conditions, but to 90,000 up to 175,000 lb. He pointed out the great difference in the strength of a material as measured in tension and transversely. Thus a bar with 100,000 lb. elastic limit in tension will be likely to give 130,000 lb. or more when tested transversely. Furthermore, the stresses on leaf springs are purely nominal, as some of the plates reverse from positive to negative. Much material along this line was covered in a series of five articles, which the speaker published in 1918 in the *Journal of the Franklin Institute*.

Ring Springs

Mr. Wikander, in his paper, described a form of friction spring with high stressing efficiency. This

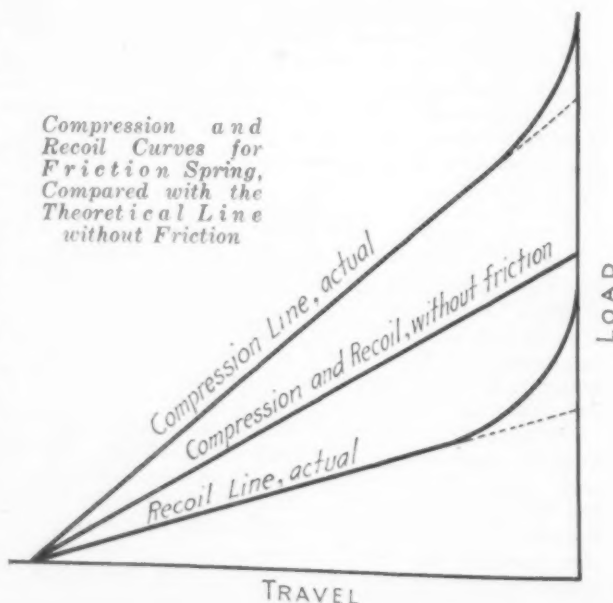
was said to be adapted to uses where high capacity, low weight or small volume is desirable and where a considerable power absorption is not objectionable. In coil springs the stressing efficiency was estimated by the author at about 50 per cent. This was based on the fact that the stress varies from a maximum in the outer fiber to zero at the neutral axis. For leaf springs he put the efficiency at about 10 per cent.

In the form of spring described, illustrated herewith, rings of double wedge shape are assembled in such manner that compression of the spring compresses inner rings and at the same time expands outer rings. Under proper design every cubic inch of material is stressed close to its maximum. This makes the stressing efficiency very high—approaching 100 per cent. With the thickness of material small, compared with the diameter of ring used, the highest results are obtained. In analysis and design the portion marked A is considered as an element. All other elements are similar.

Friction between the rings results in making it necessary to apply more force to compress the spring than is called for by theoretical requirements. Correspondingly the recoil is below the theoretical. The stress in the several members is figured from the travel of the parts along the axis.

Proper designs of springs of this character show that the load upon the spring for a given travel is about 50 per cent more with the friction than the compression line would show theoretically. Similarly the recoil line is about 50 per cent below the compression line. In practice the solid lines of the diagram would be followed, in place of the theoretical dotted lines. The friction depends upon the coefficient of friction and simultaneously upon the tangent of the angle of contact between rings.

Sectional areas of the rings are an important feature of design. With the outer ring of the same area as the inner it is evident that, in operation, it would be stressed to a higher degree than the inner,



because its mean distance from the axis is greater. Consequently it is customary to design the inner member with a smaller sectional area than the outer, and to subject it both theoretically and actually to a higher stress. The justification for this lies in the fact that, if failure does occur, with an inner ring the material cannot get away and no disaster is likely to ensue. Bursting of an outer member, however, might cause great trouble.

One principal use for this type of spring is in railroad draft gear. Another use in railroad work is for carrying car loads, particularly where a frictional resistance is desired, to damp oscillations set up by inequalities in the roadbed.

Steel by Direct Processes

The Bureau of Mines, Department of Commerce, has for some time been working on the problem of sponge iron production by several promising methods. This work, which was being conducted at the Northwest Experiment Station, Seattle, was, at the beginning of the present fiscal year, transferred to the North-Central Experiment Station, Minneapolis. In the laboratories of the Minneapolis station, work has been conducted during the past year on the factors affecting the time rate of iron ore reduction. The results of these experiments are applicable to the sponge iron investigation and will therefore be continued, giving the station a means of interpreting scientifically the results obtained in the sponge iron experiments.

A number of other investigations on the metalliza-

tion of iron ore and on the production of sponge iron are being carried on. The Bureau of Mines is now planning work to fit in with the problem of production of steel by direct process considered as a whole.

"No Accident Month" in Western Pennsylvania

November was set apart as "no accident month" by the Western Pennsylvania Division, National Safety Council, and the reports as to the success of the safety campaign show some remarkable reductions in lost time accidents. The Carnegie Steel Co. reports a decrease of 41.5 per cent in accidents that caused lost time, as compared with November, 1924, and a decrease of 78.86 per cent as compared with the average for that month over the past 10 years.

November Record in Automobile Output

A new November record was established by the automobile industry last month when 379,300 passenger cars and trucks were produced, according to the National Automobile Chamber of Commerce. The total output for the first 11 months of 1925 was 3,997,954 vehicles, exceeding the record for that period in 1923 (the record year) by 5.6 per cent. Production for November, however, showed a marked drop from that of October, which was 452,392. Two days' production of December, at the November rate, were sufficient to make a new high yearly record.

Where Steel Exports Went in October

Canada Took 295,907 Tons of Nine Leading Items in Ten Months—Japan Third with 71,006 Tons, Following Cuba, 77,698 Tons—Argentina Took 50,551 Tons

Exports from United States, by Countries of Destination

(In Gross Tons)

	Steel Plates					Galvanized Sheets					Black Steel Sheets				
	October		Ten Months			October		Ten Months			October		Ten Months		
	1925	1924	Ended	October		1925	1924	Ended	October		1925	1924	Ended	October	
Total	7,971	7,996	83,527	76,183		9,679	13,851	132,250	88,920		6,999	17,753	72,793	128,713	
Canada	7,252	6,708	65,156	59,530		1,733	1,156	21,618	15,376		3,280	2,638	36,025	31,280	
Japan	....	160	916	459		537	1,054	3,473	12,014		2,092	14,456	25,679	88,444
Cuba	106	160	1,031	1,258		1,169	1,801	9,472	10,019		32	99	1,033	815	
Philippine Islands..	....	4	244	955		907	726	14,365	11,669		....	....	138	....
Mexico	....	128	1,021	662		695	679	6,371	4,727		....	....	....	....
Argentina	....	....	....	....		541	6,185	34,599	10,691		....	51	747	69
Chile	....	....	....	....		62	57	1,583	1,210		....	....	....	....
Colombia	....	....	....	....		503	369	1,826	3,025		....	....	....	....
Central America...	....	....	....	....		....	210	....	3,765		....	....	....	....

	Steel Rails					Barbed Wire					Plain and Galvanized Wire				
	October		Ten Months			October		Ten Months			October		Ten Months		
	1925	1924	Ended	October		1925	1924	Ended	October		1925	1924	Ended	October	
Total	9,437	13,241	140,270	171,116		6,148	9,636	59,355	76,473		3,195	2,078	30,560	33,213	
Canada	2,831	2,335	19,816	16,785		242	1,027	1,626	1,730		1,087	536	12,098	7,523	
Japan	3,249	....	7,859	32,470		....	....	....	....		....	20	641	3,842
Cuba	262	4,520	33,811	43,737		71	778	3,678	7,064		123	152	1,940	1,511	
Philippine Islands..	209	157	3,378	5,323		....	....	1,140	383		4	....	879	23
Mexico	399	185	4,761	8,044		78	422	4,584	3,205		425	277	792	2,260	
Argentina	....	....	....	....		1,282	893	8,175	9,245		353	4	1,024	3,541
Chile	872	491	5,606	9,102		....	....	....	....		....	26	110	26
Colombia	243	1,022	1,864	9,004		659	610	4,106	5,583		....	....	....	....
Brazil	....	834	6,030	9,999		569	3,787	12,887	26,134		....	....	....	....
Honduras	132	340	1,314	2,967		....	....	....	....		....	....	....	....
Australia	....	....	....	....		....	....	....	....		298	366	2,103	6,282

	Tin Plate					Plain Heavy Structural Steel					Steel Bars				
	October		Ten Months			October		Ten Months			October		Ten Months		
	1925	1924	Ended	October		1925	1924	Ended	October		1925	1924	Ended	October	
Total	14,712	13,560	128,056	134,102		13,796	8,081	82,452	86,539		8,704	9,036	91,090	87,687	
Canada	1,865	1,756	31,862	20,123		11,895	....	56,135	....		5,680	....	51,581	....
Japan	4,586	8,573	30,481	36,213		....	....	992	....		24	....	965	....
Cuba	69	336	4,220	4,801		605	....	17,338	....		500	....	5,175	....
Mexico	389	191	4,643	3,185		51	....	....	....		....	....	....	....
Argentina	871	678	5,996	7,816		....	....	....	....		....	....	....	....
Chile	389	1,089	5,212	2,898		152	....	1,759	....		....	....	....	....
China	1,342	117	11,633	23,284		....	....	....	....		....	....	....	....

NATIONAL DEFENSE

Industrial Preparedness Meeting of Engineers in New York

That "steel won the war" was the statement of Frank A. Scott, president Warner & Swasey Co., machine tool manufacturer, Cleveland, and chairman of the National Defense Division, American Society Mechanical Engineers, in introducing Judge E. H. Gary as chairman of the national defense meeting held at the Engineering Societies Building, New York, Friday evening. Mr. Scott referred to Judge Gary as "America's first business statesman."

In his opening remarks Judge Gary expressed the fear that the national defense movement may become the "football of politics."

"For several months," he continued, "we civilians have looked with amazement and with some concern upon the antics of a departure in War Department and Navy Department circles. Loose general charges unsupported by specifications, mere assertions offered in the guise of facts, personalities placed before patriotism, apparently have attained a certain vogue in portions of the public mind. Perhaps it is well that this meeting happened to be called at this particular juncture. Until now most thinking Americans have felt that exaggeration would eventually defeat itself and that ultimately sensation would give way to common sense."

"We have felt that the able and distinguished board assembled by President Coolidge to examine into the entire question of aviation, as it affects national defense, would arrive at conclusions and point out any necessary remedies which should set at rest any misgivings any of us might have entertained as to whether all was well in the great departments charged with national defense."

"The statesmanlike report of the Morrow Board should put an end to controversy. All concerned have

had a day in court and in a spirit of fairness should abide by the referee's ruling. But we hear that this may not be the case. We view with apprehension the possibility that national defense may become the football of politics in the forthcoming session of Congress. There appears to be a desire on the part of a certain element in Congress to investigate the investigators and so prolong the controversy ad infinitum, whereas what the Army and Navy really need most at this time is a moratorium of agitation from within and investigation from without."

A representative group of manufacturers, engineers, chemists and others interested in industrial cooperation in national defense attended the meeting and heard speeches by Secretary of War Dwight F. Davis, Assistant Secretary of War Hanford MacNider and General J. G. Harbord, president Radio Corporation of America.

Secretary Davis dwelt upon the vast business organization of the War Department and he made the comment that perhaps its greatest service to American industry has been in the introduction of standardization.

Colonel MacNider, assistant secretary, said that the country's best insurance is not a great army but an expert nucleus and a well-conceived, all-inclusive and expert structure of emergency insurance plans, such as the department has built up since the war. This plan is now being carried down to every one of the seven principal sources of supply of war materials.

General Harbord said that industrial preparedness could not be separated from the rest of the national defense plans. "What we are practicing," he said, "is the kind of peace patriotism which, if carried to its logical conclusion, is the best guarantee against war."

Major General Charles P. Summerall, commanding the Second Corps Area with headquarters at Governors' Island, New York, expressed the appreciation of the Army for the cooperation of Judge Gary and other industrial leaders in the preparedness movement.

Weirton Steel Co. Prepares for Plant Additions

Clearing the sites for new units of the Weirton Steel Co., Weirton, W. Va., has been started. The company will more than double the capacity of its by-product coke plant. This plant consists of 37 ovens and the addition will be 50 ovens. An 800-ton blast furnace and four open hearth furnaces capable of 150 tons per heat are to be built, and the sheet mill plant, now comprising nine hot and four cold mills, is to be doubled in size. A tube mill to produce 10,000 to 15,000 tons a month also is listed. The company has not yet placed the contracts for any of these improvements, pending the completion of engineering details, but through the clearing of sites and excavations it will be ready to go ahead promptly with the new construction. A new scrap and pig iron storage yard will be ready for use in about a month and work already has been started on a new dock for handling river shipments of raw and finished materials.

Machinery and Equipment as Investments

In a talk before a group of industrial advertisers recently at Atlantic City, N. J., E. P. Blanchard, advertising and assistant sales manager of the Bullard Machine Tool Co., Bridgeport, Conn., stressed the importance of regarding machinery and equipment as an investment and not to be considered as a direct cost applicable to the goods to be produced.

Cost methods employed in some plants are not well founded, Mr. Blanchard pointed out, in that they fail to take proper cognizance of the investment feature of machinery. After commenting on several methods of cost accounting held to be fallacious, Mr. Blanchard said that "the only fair way for computing actual costs and savings therefrom, for comparison, is the produc-

tion center basis with each unit involved, or the processes surrounding that unit and affected by it, forming the individual production centers. Only in this way can one determine the exact relation of actual expense and actual labor cost." He added:

"The gradual development of machinery and the consequent transfer of function from manual to mechanical methods results in varying ratios of labor to machinery and it is altogether unfair to compare direct labor figures and cover machine expense by a mere percentage for overhead. Yet this is being done in the majority of comparisons that are made at the present time. Furthermore, costs, to be convincing must be figured on the job and by the method which is acceptable to the interested parties. . . ."

Conservation of Power in Industrial Plants

Following is the tentative program for the conference at the Engineers Club, Philadelphia, Feb. 16, to discuss means for improving the making and use of power, from the standpoint of the practical economist:

When Is the Private Power Plant Justified? by David Moffat Myers, consulting engineer, New York.

Operating a Private Power Plant in Competition with Purchased Power, by Thomas V. Balch, supervising engineer Equitable Building, New York.

When Is Purchased Power Justified?

High-Pressure Prime Movers in Industrial Plants, by J. F. Johnson, Westinghouse Electric & Mfg. Co.

Use of Exhaust Steam for Process Work in Textile Plants, by Samuel M. Greene, consulting engineer, Springfield, Mass.

Heat Insulation, by L. B. McMillan, chief engineer Johns-Manville, Inc., New York.

Power Transmission Economies, by William Stanlar, transmission engineer, duPont Co., Wilmington, Del.

Lubrication and Bearings, by John D. Gill, Atlantic Refining Co.

Discuss Art of Handling Men

Applications of Industrial Psychology and Influence of Plant Design Reviewed at Joint Meeting of Taylor Society and Mechanical Engineers

CONSIDERATIONS relating to the art and science of handling men, as seen in industry today and an evaluation of the successes and failures that are found were dealt with by Lillian M. Gilbreth, Frank B. Gilbreth, Inc., consulting engineer, Montclair, N. J., in a paper on "The Present State of Industrial Psychology," presented at a joint session of the Taylor Society and the management division of the American Society of Mechanical Engineers, during the annual meetings of those societies held in New York, Nov. 30 to Dec. 5.

The subject was discussed in four parts: 1, Selecting or finding the right job for the right man; 2, teaching or training the man for the job, for promotion and for satisfactory adjustment to industrial life; 3, fostering technical cooperation, or training men to work together in production activities; and 4, fostering group contacts, or training men to function as group members and groups to function together.

Efficient Methods of Selecting Men Being Applied

In the field of selection, said Mrs. Gilbreth, we find today not only well-thought-out theories as to efficient selection, but a gradually developing technic. Selection is being done increasingly by an employment manager or personnel man or by an employment department, rather than by the older policy of having the department that requires a worker interview the applicant and make the selection for itself.

An employment department must know the general type of worker that the organization desires. There must be also an intimate knowledge of the various types of work done; of the qualifications necessary to fill the various positions in the organization; of both the opportunities and limitations of each job; of the type of training afforded; of the type of promotion available; of the worker's surroundings, equipment and tools and of the work method used. These are necessary to present a satisfactory outline of the work to the possible worker and to evaluate him in view of the total situation that he is to face. There must be a knowledge of the science of selecting men, and of that art of selection which includes gaining the applicants confidence, noting and evaluating his behavior and attitude as well as his specific responses, and being able to put ones self in his place in order to estimate correctly both what he says and what he means.

Selection by the department which is to use the man was said to have certain advantages, these being partially transferred to the employment department, however, by sending a member of that department with the applicant to the work place before the final hiring is done. He can note the impression that the job and work place makes upon the applicant. He then gets an idea of possible adjustment and often prevents a later departure, dismissal or transfer. There is no better test of acquaintance or intimate knowledge of an occupation, said Mrs. Gilbreth, than seeing the worker in the proposed work place. The way he looks about is indicative; the comments that he makes are significant, and if he once handles the machinery or tools, his experience and skill can be fairly estimated.

Intelligence Tests Much Underrated

The advantages and disadvantages of the questionnaire method of selection were reviewed briefly and the value of tests in selection discussed. Of intelligence tests, it was said that at first they were overrated, have of late been much underrated, but will prove of increasing value. At present conservative in-

vestigators claim only to have standardized such tests to determine the lower boundaries of intelligence. It is possible to locate such applicants as are unfit for the industry to which they are applying; while the requirements remain what they are, many jobs are being filled by those of far too high a type of mentality. Better teaching in industry was said to make possible selecting workers of a lower type who can perform the work if they are developed to the height of their ability, and who will receive permanent satisfaction both in the performing and in the wages received.

It was stated that no sound psychologists claim today that intelligence tests can determine the upper boundary of intelligence. It is therefore never safe to suppose that one knows exactly to what heights of promotion an applicant can be trained, or to make recommendations restricting training and promotion.

Satisfactory tests of specific abilities cover today only tests for such simple things as reaction time, and it is not to be expected that an applicant for any complicated type of work can be thoroughly evaluated by such tests as can be given during the test period. Trade tests were said to be successful where the applicant is actually tried out on essential parts of the specific trade to which he is to be put. Psychological tests should be accompanied by physical examinations and also by a psychiatric examination as extended as is practicable, said Mrs. Gilbreth.

Selection of employees who are already hired for other work was discussed briefly, and a "three-position" plan of promotion suggested. This plan provides that every worker occupies constantly three positions in the organization—that of teacher in the position he has left, that of worker in the position that he occupies, and that of student in the position he desires to occupy. Where this is in use throughout an organization, said Mrs. Gilbreth, selection for promotion becomes easy.

The increasing appreciation of the fact that every worker in industry must be constantly taught, if he is to attain his greatest efficiency, was characterized as a distinct advance in the application of psychology to industry.

Matching the Worker to the Work

Applied psychology has devoted much attention to the field of matching the worker to the work. Every job in a systematized or scientifically managed organization is analyzed, and standard job specifications are a part of the orthodox present practice. The first step in this process is to make a survey as to what the job covers as it is done. This is supplemented by an evaluation of the job. The psychiatrist studies and evaluates the job from the emotional standpoint. He tells for whom such work would be bad, whom it would not affect, whom it would help. The psychologist states the mental ability that it demands. The physiologist states the amount and kinds of energy involved and the fatigue. The physician, the planning, employment and training departments, the supervisors or department managers and efficient workers who have had experience with it and are able to say which things help in doing the work and which hinder, what one may expect from the work as to production and satisfaction as well as the possible evil effects—will add their evaluations. The combination of these findings gives data which form a picture of the total situation of the worker at the work. When a complete evaluation of a job has been made all records, including turnover and motion study records, should be consulted to verify the evaluation.

Teaching, it was said, is not complete when the

method has been standardized and the group has been taught to that point where its members can perform the activity to their satisfaction and it has become such a habit pattern that there is little fear of lapse into an older, poorer method of performing the work. At stated intervals the job should be resurveyed. Automaticity, "the greatest free asset of the workingman," is the result of habit.

The securing and directing of technical cooperation was said to be largely a matter of individual contacts, worker with worker, worker with teacher, worker with supervisor, etc., and of cooperative transfer of skill. The securing of profitable group contacts has less to do with intelligence and skill than with the psychology of securing good will. Here the emotions must be considered and we have special need here for the psychology of the total situation. There must be as little emphasis as possible on the differences between the management and the men. There must be a stress on likenesses and an attempt to think of all members of the organization not as individuals but as primarily members of an industrial group.

Efficiency Affected by Plant Design

CAREFUL analysis of the needs of the manufacturing process and the designing of the plant to fit those processes, when enlarging a factory or in developing a new plant, were considerations stressed by Harold T. Moore, industrial engineer, Day & Zimmermann, Inc., Philadelphia, in a paper on the "Influence of Plant Design on Plant Efficiency." Mr. Moore's paper was presented at a joint session of the Taylor Society and the management division of the A.S.M.E., held Dec. 3.

Many factories have modern equipment and efficient methods but an unbalanced distribution of floor space, with some departments congested and others misplaced, said Mr. Moore. Some industries located in multiple-story buildings are handicapped by lack of flexibility, which might be avoided if space had been available for single-story construction, or for a combination of single and multiple-story. Some building widths or the spacing of columns are not well suited to the machinery size or spacing and prevent an ideal arrangement from being adopted. In some instances headroom is not sufficient for overhead handling of materials. Many of these handicaps might have been avoided if more care had been exercised in the selection of the site, the location of the original buildings on the property, and the design of the initial plant.

It was said to be of considerable assistance, both in making the selection of a site as well as in locating the first buildings on the property, to have a preliminary idea of the type of layout preferred. A tentative plan of an ideal plant based on the floor space and process requirements without regard to property limitations is a safer check on the suitability of a site than only an estimate of the total floor space required.

Preparatory to starting the design of a new plant, the industrial engineer to whom the plant development work has been assigned should become familiar with all phases of the production and assembly operations, including the types and capacities of equipment to be used in the manufacturing. The major considerations which have a bearing on space requirements or plant arrangement and which should be carefully analyzed and correlated before starting the plant design, were given as follows:

1. The desired capacity of the initial plant and the estimated future capacity to be anticipated in terms of production units.
2. The divisions of the manufacturing schedule to determine the number and variety of the sub-assembled or finished units to be produced.
3. A list of materials or parts comprising the product to determine which ones will be manufactured and which ones purchased and stored.
4. The production equipment or plant facilities needed for the desired capacity of the initial plant, including any special provisions or structural features which will facilitate production.
5. A study of the manufacturing and assembly operations necessary to produce a finished or sub-

assembled unit to check the proper spacing of equipment.

6. The time interval required between successive operations, if any, to check the need for and the location of intermediate storage space.

7. The sequence of operations in manufacturing and assembly departments in order that departments and equipment shall be in logical and convenient relationship for the progressive flow of materials.

8. The space requirements per department to house the production equipment and provide the space needed for aisles, storage, and auxiliary departments.

9. A review of the various operations entering into the process to determine whether certain departments should be isolated from the standpoint of safety, comfort, noise, or special process needs.

10. A summary of the floor-space needs of the initial plant, which areas can be proportionately increased for the different departments, based on an assumed future capacity after a certain period of years, thus providing an approximate basis for estimating the space requirements and developing a layout suitable for the ultimate plant development.

The foregoing factors include the essential data upon which the design of the initial plant should be based. They establish the floor areas needed, the size of departments, the sequence of operations, and consequently the routes for the flow of materials. With this information available, the engineers who have studied the manufacturing needs of a particular industry should be sufficiently familiar with the problems involved to undertake the development of the plant design.

Although sufficient basic data may have been acquired to permit of working up preliminary layouts which will meet the process requirements in general, the ideal layout may not be a suitable one for the particular factory site acquired. It was said to be advisable therefore for the design engineers to inspect the acquired or proposed site and obtain a mental picture of the local conditions which will have a bearing on the plant arrangements and its location on the property. Information as to boundaries, data as to the nearest sewers, water and gas mains, the location of electric lines, railroad tracks, etc., will be needed. The bearing value of the soil should be checked, and city or State regulations as to sanitary, safety and welfare provisions reviewed.

In erecting additions to existing plants to provide for increased capacity, it was said that the floor-space distribution in the existing plant should be analyzed in a similar manner and a routing diagram made to trace the flow of materials.

Production Aided by Study of CO₂ Exhaled by Workers

IN a paper on "Carbon Dioxide as an Index of Fatigue," also presented at this session, Walter N. Polakov, president Walter N. Polakov & Co., New York, discussed the relation between work done and the carbon dioxide exhaled as an index of fatigue of the worker, and described a technique of observation intended to provide a simple and practical guide for management engineers in solving some of their problems.

Observations made on firemen engaged in stoking hand-fired boilers were described, samples of gas exhaled by the men having been taken every 30 min. by direct exhalation into a hand air pump and by collecting the pure samples of 50 cc. in a hand CO₂ analyzer. In order to obtain data on the relation existing between the nature of the work done and the gas metabolism, the author had to sacrifice volumetric measurements. This, however, was not deemed detrimental as he intended merely to develop a handy shop method which would serve with a sufficient approximation to establish a simple, practical method applicable in factory environments, and to use this method for the strictly utilitarian purpose of modifying existing working habits so as to reduce the strenuous elements of productive work.

The results of a number of observations of different occupations made in various industries are discussed in the paper. In conclusion it was said that the convenience, simplicity and accuracy of indications obtained by the CO₂ analysis method offer a means heretofore unavailable to reduce the fatigue resulting from (necessary) work motions by readjusting operations or by providing labor-saving means to reduce CO₂ peaks.

It was further stressed as offering an unmistakable means of judging whether men are properly trained to conserve their energy while working. "It likewise offers a more reliable guide for placing men and women in jobs which will not overtax them physically," said Mr. Polakov, "thus management, foremen, instructors and personnel supervisors will gain much by using this method and by substituting facts for mere judgment. They will save human energy, thus enhancing the health of the workers and the productivity of labor."

Where Should Management Engineering Be Taught?

DISCUSSION on the subject of "should management be taught by the engineering school or by the school of commerce or business administration" followed the presentation of Mr. Polakov's paper. The occasion for this discussion arose apparently from a controversy in the educational field and it was felt by the mechanical engineering society that a stand should be taken in the matter. A resolution introduced by Robert T. Kent, consulting engineer, New York, chairman of the A. S. M. E. management division, and chairman of the meeting was carried. This resolution read: "Whereas, it is becoming evident that certain schools with non-engineering faculties are attempting to teach industrial and manufacturing subjects relating to the art and science of management, and whereas, the A. S. M. E. has recognized management as a major of engineering, be it resolved that the teaching of industrial engineering, and, or, management engineering should properly be done by schools of engineering." Practically all of those discussing the resolution spoke in favor of it.

The characteristic scheme of technical education in three well defined grades which prevails in central Europe was interestingly discussed by W. E. Wickenden, director of investigation, Society for the Promotion of Engineering Education, New York, in an address at a session on education and training, for the industries, of non-college type. Mr. Wickenden has recently returned from Europe, where he has been making extensive studies of training for the industries, and he plans to publish shortly a report contrasting European and American conditions in this field of education.

Labor Interested in Management

LABOR'S ideals concerning management, which with capital and labor were said to be the important factors in industry, were outlined by William Green, president of the American Federation of Labor, in an address delivered at the evening session held Dec. 3.

"Not until recently was management considered of great importance," said Mr. Green. "Formerly capital and labor were regarded as the only essential factors. This view prevailed during the period when the relationship between employers and employees was of a more personal character. It must be relinquished because financial changes have taken place, until now, through the diversified ownership of corporations, management control has supplanted personal ownership control. This brought with it the formation of new relationships and the assumption of new responsibilities."

"Labor is intensely interested in this changed relationship because it is directly affected by it. It is facing the facts which this change has brought with it in a spirit of good will. It hopes and believes that this changing process will result in industrial improvement and human betterment."

In another part of his address, Mr. Green said: "Labor realizes that the success of management means the success of labor. For that reason, labor is willing to make its contribution to assist management and to bring about the right solution of problems dealt with by management. Some of these problems are regularization of employment, fluctuation in prices, standardization of output, healthful and sanitary conditions of employment and the ever-pressing problem of unemployment."

Labor, he said, entertains many ideals concerning management, chief among which is the development of cordial relations between the workers and management. The workers believe that through understanding and

cooperation the best interests of all those associated in industry can be served, said Mr. Green.

Taylor Society Meetings Well Attended

IN addition to those held jointly with the A.S.M.E., and reported above, several sessions of the annual meeting of the Taylor Society were held separately. The opening day of the meeting, Dec. 2, was devoted to special sessions for teachers of management, a paper on "Basic Pedagogics for Teachers of Management" being followed by a symposium on "Experiences with Different Methods of Teaching Management." Good attendance marked all sessions. The absence of Dr. H. S. Person, managing director of the Society, because of illness, was a regretted incident of the annual meeting as a whole.

A symposium on "The Relations of the General Manager and His Principal Executives" was outstanding. The society plans a study of the function of the chief executive, this study aiming toward an eventual "job analysis" of the position of chief executive. A list of propositions derived from an analysis of actual cases and concerning both the fundamental and detail aspects of the relationship has been drawn up, and prominent chief executives from a variety of industries were invited to speak on the propositions. Among those discussing the propositions was Howard Coonley, president of the Walworth Co., Boston, who said that the greatest duty of the chief executive to subordinates was that of inspiration, inspiration by his own methods and thinking and by his recognition of their work. In Mr. Coonley's company contact of the chief executive with those next in authority is by conference, the advisory type of committee being preferred to the executive committee. Advisory committee meetings are held once a week, every major problem of the business, whether of policy or execution, being discussed. Other committee meetings include a quarterly meeting of all executives, including second line executives, all executives meeting on an equal basis. Mr. Coonley said that he believes strongly in definition of jobs in an organization, and the feeling of common interest and common friendship as the basis of the confidence of those one works with.

In a paper on "Purpose as a Psychological Factor in Management," contributed by Ordway Tead, New York, purpose and motives are stressed as of equal importance to the success of managers as are their methods. It was the intention of the paper to consider what line can be followed by managers to get industry on a basis where good will is manifested, where cooperation between groups is willing and not enforced, where conflict is a creative rather than a destructive force. It was said that the problem of relations between the several groups in industry, and especially between managers and the rank and file will make little progress toward amity unless and until managers consciously strive to change conditions and methods so that the individuals in these several groups can share in and work for the same purpose.

C. L. Barnum, comptroller of the American Radiator Co., New York, addressed a luncheon meeting on "Preserving Ideals in the Solution of Practical Problems." It was shown that an engineer approaches his problem by developing a plan, the plan being an ideal but based on facts. An ideal is a "standard." With a standard based on fact, it is not difficult to reconcile practical problems with ideals.

The closing session, held Dec. 5, was devoted to a discussion of "Sales Policies and Sales Methods: An Appraisal by Purchasing Agents," a paper on the subject having been contributed by A. J. Arthurs, general purchasing agent, Larkin Co., Inc., Buffalo.

Officers Relected

Percy S. Brown, works manager, Corona Typewriter Co., Inc., Groton, N. Y., was reelected president, and Howard Coonley, president of the Walworth Co., Boston, vice-president of the Taylor Society. New members of the board of directors are Lillian M. Gilbreth, Gilbreth, Inc., Montclair, N. J., and H. K. Hathaway, industrial association, San Francisco, who replace W. B. Ricketts, Operadio Corporation, Chicago, and Mary Van Kleek of the Russell Sage Foundation, New York.

Pittsburgh Pig Iron Output Trend

Production in Pittsburgh, Western Pennsylvania and New York Districts—Comparison with Cycles for United States

BY HOMER B. VANDERBLUE AND WILLIAM L. CRUM*

WEST of the Alleghenies the iron producing industry is based upon different economic resources from those of the Eastern Seaboard, discussed in a preceding article of this series. The iron industry of the Eastern Seaboard uses local or imported ores for the most part and brings its fuel largely from the interior; whereas the industry west of the mountains finds its fuel close at hand and brings its ore supplies from the ranges at the head of Lake Superior. The western blast furnaces are located principally either at interior points which were chosen originally as the sites for furnaces because of proximity to ore and fuel supplies (e.g., Pittsburgh and environs), or at the lake ports (e.g., the ports on Lake Erie from Toledo to Buffalo), which are meeting places of supplies of ore from the ranges and of fuel from Penn-

for 1902 to 1907 and 1919 to 1924, each of which intervals comprises roughly two complete cycles of production. In the 1919 to 1924 interval the region produced nearly 33 per cent of the pig iron output of the United States. This figure is only slightly below the percentage, 35.4, found for the earlier interval. Thus there has been little change in the relative position of this region in the iron industry as a whole. The percentage increase from the earlier six-year period to the later six-year period was 37, which should be compared with 47 per cent for the United States. It appears, therefore, that the output of the region increased very considerably during the 24-year period; but that the rate of increase was somewhat less than for the entire iron industry.

Study of the three individual districts, however,

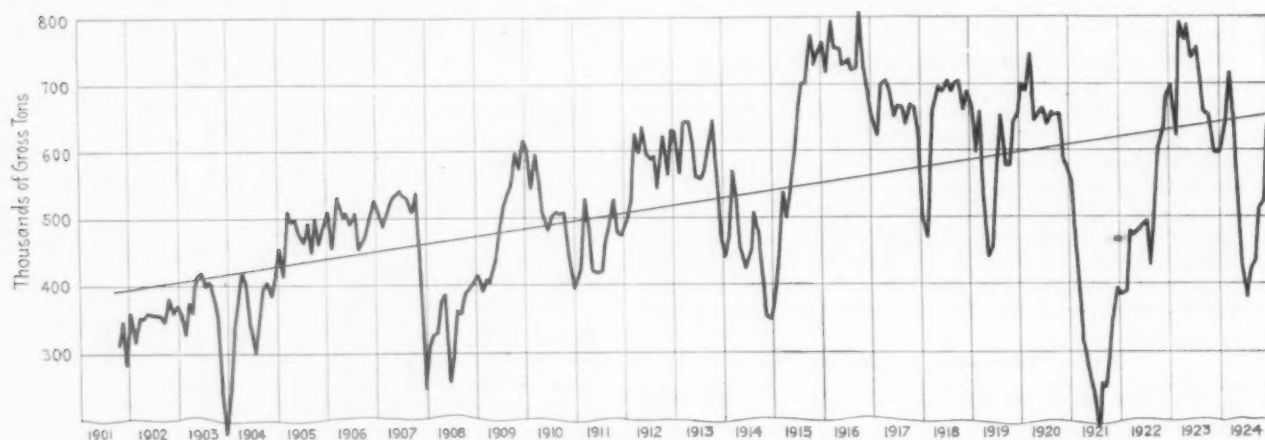


Fig. 1—Actual Pig Iron Production in the Pittsburgh District, With Line of Long-Time Growth

sylvania, Ohio and West Virginia. The hauling of coal from the mines to these ports and of ore from them to the interior blast furnaces and steel plants constitutes the principal service performed by the railroads which have terminals at these ports.

The present article considers the production of one district which includes no furnaces located at lake ports—the Pittsburgh district; one district which includes mainly furnaces which are at a lake port (Buffalo)—the New York district; and one which includes mainly furnaces located at interior points—the Western Pennsylvania district. All are largely dependent on Lake Superior ores, although some ore from the mines of northeastern New York is occasionally transported to the furnaces at Buffalo. The few furnaces in New York State which are outside the neighborhood of Buffalo depend largely upon the nearby Adirondack deposits for their ore supplies.

Relative Production Fairly Uniform

Significant data on the importance of the region comprising the Pittsburgh, New York and Western Pennsylvania districts appear in Table I. The major comparisons rest on the average monthly production

reveals considerable diversity of movement. The percentage which the output of the Pittsburgh district bore to the total United States output declined from about 25 in the earlier interval to nearly 22 in the later, and there was also a slight decline for the Western Pennsylvania district. The New York district, on the other hand, showed an appreciable increase in its share of the total output of the United States. But examination of the actual figures for the New York district (Fig. 2) shows that this is due probably to the strikingly low production in New York in the years 1901 to 1904, when the development of Buffalo as a steel-making center on a large scale was just getting under way.

Percentage increases from the earlier to the later six-year interval were large for all three districts; 31 for Pittsburgh, 93 for New York, 18 for Western Pennsylvania. The rapid development in New York was due primarily to the growth of Buffalo as a steel and iron center, while the slower rate of growth in the Western Pennsylvania district is due probably to the presence there of relatively small isolated furnaces, many of which were engaged in making merchant pig iron.† The proportion of merchant furnaces is consid-

*Of the Harvard University Committee on Economic Research, Cambridge, Mass. This is the third of a series of articles which, in considerably greater detail of treatment and with scientific development of the statistical methods of analysis employed, are to appear later in book form. The first article appeared at page 896 of our issue for March 26; the second, at page 210, July 23.

†Prof. O. W. Blackett has shown in *Review of Economic Statistics*, Vol. VII, page 205, that, whereas the daily rate of production of pig iron for all furnaces had increased from about 50,000 gross tons per day in 1903 to about 80,000 tons in 1914, the daily rate of production for all merchant furnaces had remained practically unchanged, in the neighborhood of 20,000 tons per day.

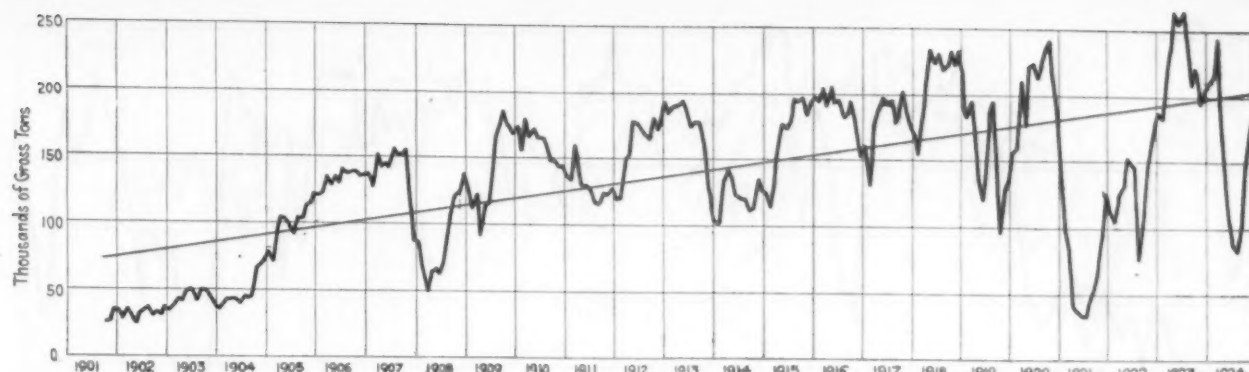


Fig. 2—Actual Pig Iron Production in the New York District, With Line of Long-Time Growth

erable in New York State; but it is negligible in the Pittsburgh district. Practically all of the iron made in the latter district is produced by steel companies.

The actual production in each of the three districts is shown, together with the appropriate line of trend, on Figs. 1 to 3. These all trace the steady upward drift which indicates a normal expansion of output

do not differ widely from that for the region, New York having the most rapid growth, as noted in the examination of Table I. Thus Table II brings out clearly the fact that the region has failed to depart in any large degree from the fairly rapid growth which has characterized the iron industry of the United States as a whole.

Districts Compared with Nation

On Figs. 4 to 6 are shown the curves of cyclical indexes for the total production of pig iron in the United States (dotted) and for the Pittsburgh, Western Pennsylvania and New York districts (full lines). These cyclical indexes, or "adjusted relatives," were obtained from the actual monthly data by correction for trend and seasonal variation, as explained in the first article of this series. All three charts trace the successive movements of expanding and contracting operations in the several business cycles which have occurred during the present century. But, despite the general similarity of the curves to each other and to the standard (United States) curve, there are certain significant differences which call for brief comment.

The similarity between the district curve and that for the United States as a whole is greatest in the case of the Pittsburgh district. This is doubtless due to

Table I—Average Conditions in 1902 to 1907 and 1919 to 1924

	—1902 to 1907—		—1919 to 1924—		Per Cent In-
	Average Monthly Production, Gross Tons	Per Cent of the United States Total	Average Monthly Production, Gross Tons	Per Cent of the United States Total	crease, 1902-07 to 1919-24
United States	1,717,000	100	2,522,000	100	47
Region (comprising Pitts., N. Y., and W. Pa.)	607,000	35.4	830,000	32.9	37
Pittsburgh	424,000	24.7	553,000	21.9	31
New York	82,000	4.8	158,000	6.3	93
Western Pennsylvania	101,000	5.9	119,000	4.7	18

and facilities. But, although none of the districts suffered a real decline (in which respect this region differs from the Eastern Seaboard region, where the trends for two districts, Susquehanna and New Jersey, were found to be negative), no one of the three districts grew as much as 1 per cent per annum in the 24-year interval shown on the charts. During this period the normal annual rate of growth for the country as a whole was 2.94 per cent.

The normal annual rate of growth is represented by the ratio obtained by dividing the annual increment of the line of trend for each district by the central ordinate (the annual increment is the normal annual increase as shown by the line of trend and the central ordinate is the normal production for January, 1913). Table II presents these ratios, together with the central ordinates and annual increments from which they are obtained, for the United States, for the region consisting of the three districts, and for each of the districts.

It appears from this table that the rate of growth for the region is slightly less than for the United States; and yet it is nine-tenths of the rate for the entire iron industry. The rates for the individual districts

Table II.—The Secular Trends for the Interval 1902 to 1923

	Central Value, Gross Tons	Annual Increment, Gross Tons	Average Per Cent Increase
United States	2,249,300	66,060	2.94
Region (comprising Pitts., N. Y. and W. Pa.)	780,700	19,590	2.54
Pittsburgh	519,000	11,340	2.93
New York	136,800	5,680	4.15
Western Pennsylvania	124,900	2,570	2.06

the large importance of the Pittsburgh district in the total production (24.7 per cent of the total in the interval 1902 to 1907 and 21.9 per cent in the interval 1919-1924). Under these circumstances, any curve for total pig iron production must be heavily weighted by the production of the Pittsburgh district. The similarity of the two curves holds both for the timing of important changes of direction, when recovery sets in or depression impends, and for the amplitude of the

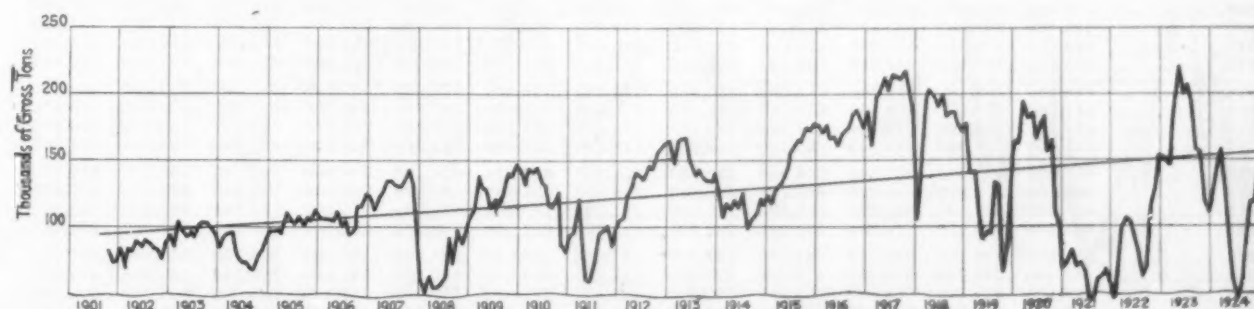


Fig. 3—Actual Pig Iron Production in the Western Pennsylvania District, With Line of Long-Time Growth

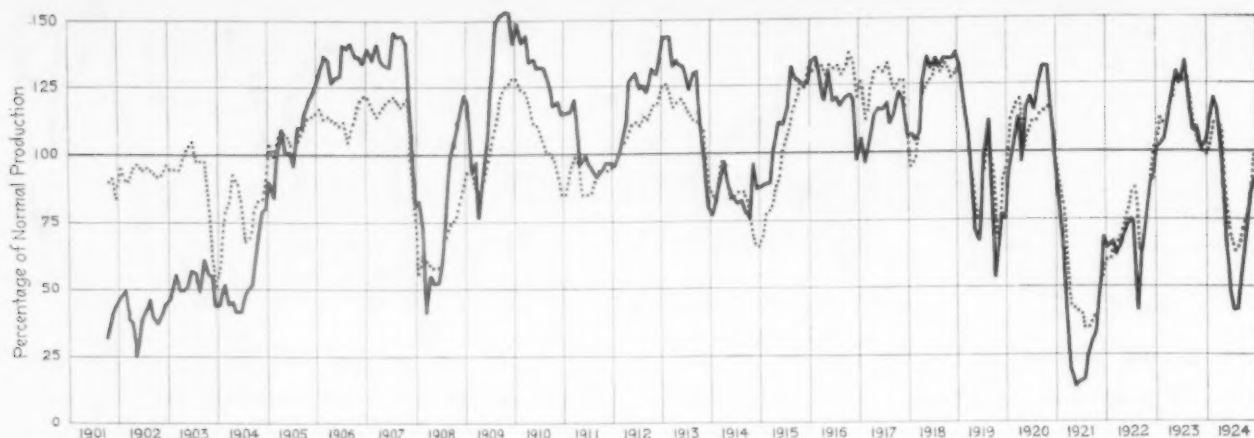


Fig. 5—Cyclical Index of Pig Iron Production in the New York District (Solid Line) Compared With Similar Index for the United States (Dotted Line)

swings above and below the normal line. The only period in which the Pittsburgh district enjoyed rather more prosperity than the industry as a whole was in 1912 and 1913. In the war years, 1917 and 1918, on the other hand, the Pittsburgh curve fell well below that for the United States, although it was sufficiently high to indicate an active condition in the industry. While recovery was prompt in 1921, the rate of recovery was slowed down by the strike conditions obtaining in 1922.

The curve for the New York district (Fig. 5), while showing principal changes of direction at about the same time as those of the standard (United States) curve, shows also a tendency to swing above and below the normal line with a wider amplitude. This tendency has been growing less in recent years, however, as large scale operations have been increasing in the Buffalo district and the old high-cost furnaces have gone out of production.* In 1923 the highest point reached by the curve was 129 per cent of normal, as compared with peak figures exceeding 150 per cent in 1906 and 1909. Actual production was of course considerably greater in 1923, as is indicated by Fig. 2. The rapid expansion of 1905 to 1907 from the very low levels of 1901 to 1904 (interrupted by the panic of 1907), and

the marked recovery of 1908 were due to the additions to the iron-producing equipment of the district made in these years, notably by the Lackawanna Steel Co., which previously had operated plants in Eastern Pennsylvania.

Violent Swings Mean High Costs

Cyclical indexes for the Western Pennsylvania district appear on Fig. 6, together with the standard (United States) curve. The curve for this district shows the same close timing with the changes of direction of the standard curve as do the others; but, in contrast with the New York curve, where the amplitude of the cyclical swings has been becoming less with successive business cycles, the amplitude of the swings of the Western Pennsylvania curve has grown progressively larger. This condition suggests that a part of the output comes from high-cost furnaces, the position of which has gradually become less advantageous with the downward price trend of pig iron in the face of advancing general prices. Such furnaces may be expected to respond to fluctuations in general business conditions by more violent changes in output than do the newer furnaces of the low-cost producers located in the Pittsburgh and New York districts.

It is probably true, also, that the presence of a considerable number of merchant furnaces in the district (and only one large steel operation, the Cambria works of the Bethlehem Steel Corporation) accounts for the extreme sensitiveness of this index. But, while the curve tends to move through a wider amplitude than do those for the Pittsburgh and New York in-

Table III.—Production of Pig Iron in the Pittsburgh District
(In Gross Tons)

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1901.....										310,500	343,900	284,100
1902.....	357,300	317,500	351,800	350,400	361,300	355,800	356,800	355,500	348,400	380,300	359,700	370,000
1903.....	360,800	328,800	372,100	362,700	415,500	420,900	402,800	405,600	386,000	357,700	242,600	178,300
1904.....	218,000	328,800	398,500	422,600	407,500	339,100	302,300	340,100	395,300	402,900	382,300	412,400
1905.....	461,400	411,100	510,300	490,800	493,600	476,700	467,000	488,100	449,600	495,400	466,500	488,300
1906.....	511,900	454,600	533,100	498,900	509,800	487,900	505,600	457,000	460,900	567,700	509,200	525,300
1907.....	505,500	481,900	511,600	530,500	537,100	544,200	534,700	525,300	509,500	533,100	409,000	258,400
1908.....	304,500	324,400	326,000	276,900	285,800	259,800	303,600	362,400	359,100	387,200	398,300	410,900
1909.....	416,600	388,000	407,100	404,000	446,700	479,400	524,100	538,300	549,000	594,700	573,400	618,000
1910.....	603,300	541,800	592,500	543,500	510,500	483,900	502,700	510,400	505,300	507,500	445,100	397,400
1911.....	409,700	424,500	531,500	488,500	422,000	415,500	419,200	469,000	482,000	529,900	478,600	474,300
1912.....	495,100	525,400	623,400	599,700	634,200	591,200	583,700	584,600	546,800	621,800	567,900	626,700
1913.....	626,100	569,400	639,800	648,200	613,300	562,200	559,300	571,000	587,100	640,800	579,400	469,900
1914.....	441,700	473,100	570,600	529,400	461,700	424,600	455,900	507,200	484,000	430,800	352,500	349,400
1915.....	370,700	429,800	537,500	497,900	538,700	595,200	668,500	699,900	700,200	773,700	730,500	750,200
1916.....	763,100	717,900	793,900	752,100	750,900	728,100	736,500	721,900	724,200	812,600	724,000	681,100
1917.....	655,200	522,600	697,500	706,000	690,900	651,800	664,500	664,100	638,600	666,700	663,900	619,900
1918.....	500,500	472,900	656,300	665,700	695,800	686,700	707,000	687,400	699,800	702,700	662,600	687,300
1919.....	668,200	593,500	661,300	531,500	447,000	461,300	547,900	651,500	578,600	579,400	646,100	653,300
1920.....	695,400	686,900	746,900	641,200	652,900	664,300	637,800	655,200	651,300	651,700	587,100	571,400
1921.....	557,400	486,700	388,000	304,300	281,400	243,000	185,600	255,300	250,100	295,700	357,900	390,900
1922.....	382,400	388,700	479,400	473,600	479,100	485,600	494,000	432,200	502,800	610,300	629,500	682,800
1923.....	694,100	624,300	790,700	769,800	789,300	737,800	759,200	713,300	660,000	654,000	595,900	595,300
1924.....	609,500	638,500	716,100	657,500	541,300	429,800	380,100	425,500	437,900	519,000	528,600	638,200

*On Jan. 1, 1905 (the first month that the figures in the IRON AGE show the number of furnaces in New York divided between the Buffalo and "all other" furnaces) 22 furnaces were reported, half in each group. At the middle of 1914, there were 19 furnaces reported for Buffalo, and seven were grouped under "all others." On Jan. 1, 1925, there were 27 furnaces reported for New York, of which 22 were in the Buffalo territory.

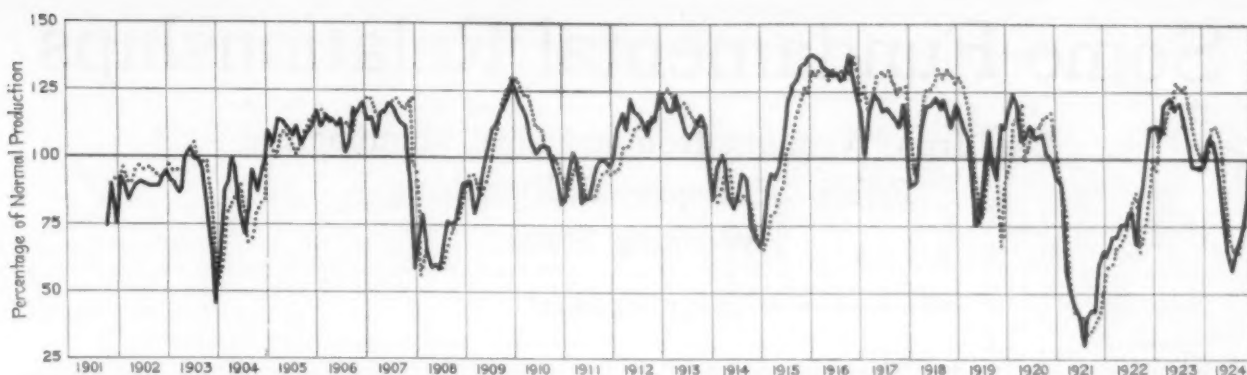


Fig. 4—Cyclical Index of Pig Iron Production in the Pittsburgh District (Solid Line) Compared With Similar Index for the United States (Dotted Line)

dexes, it does not lag on the recovery as did the curves for the high-cost districts of the Eastern Seaboard (Susquehanna and New Jersey). Even in 1924, when the curve fell below even the low point of 1921, recovery was prompt. The failure of the curve to recover

promptly in 1922, which at first seems an exception to the above statement, was due to the coal strike of that year, which had especially severe effects upon the output of the Pennsylvania fields upon which the furnaces of this district are dependent for fuel.

Scrap Reclamation Highly Developed on Railroads

In line with their general policy of bringing about greater efficiency and economy in operation, which has already made possible a marked reduction in freight charges to the public, the railroads of this country are realizing substantial savings through the reclamation of old material, according to a survey just completed by the Purchases and Stores Division of the American Railway Association.

While every road in the country has made provision for reclamation of such materials, the savings vary, being contingent on the size of the road, its location with reference to the markets and the extent to which this work is carried on.

As indicative, for instance, of the extent to which this work is being conducted, old metallic roofing and empty powder or carbide cans are converted into tin buckets, cups and other tin ware, while old broom handles and other mill offal are made into staffs for signal flags. Scrap locomotive tire steel is converted into hammers while even old hose is used for the manufacture of baggage mats. Canvas, which has reached the end of its usefulness for the purpose for which it was originally bought, is sent to the upholstering shops and there worked over into aprons for workmen, locomotive steam pipe covering and for other purposes. Broken leaves from springs are made into elliptic springs, while flues which can no longer be used in locomotive boilers are flattened and made into washers. Bolts are straightened and rethreaded, old timber is cut into planks for crossings, second hand rail is made

into guard rails, car wheels which have become flat are made usable again by grinding, while oily dirty waste taken from journal boxes is cleaned and re-oiled and again used.

New Members of National Metal Trades Association

Ten companies have recently been added to the membership of the National Metal Trades Association, Peoples Gas Building, Chicago. They embrace: The Willys-Overland Co., Toledo, Ohio; the Electric Auto-Lite Co., Toledo; the Harrison Radiator Corporation, Lockport, N. Y.; the Merritt Engineering & Sales Corporation, Lockport, N. Y.; the Moto-Meter Co., Long Island City, N. Y.; the Consolidated Steel Strapping Co., Chicago; the C. E. Deveau Machine Co., Boston; the Ohio Knife Co., Cincinnati; the Lehmann Machine Co., St. Louis; and the Bock Machine Co., Cincinnati.

Power equipment for the new blast furnace of the Midland Coke & Iron Corporation, Granite City, Ill., is being placed by the Riter-Conley Co., Pittsburgh, which has the general contract for the furnace. The Allis-Chalmers Mfg. Co. will furnish two 5000-kw. turbo-generator units, seven centrifugal pumping units and two dual exciter sets; the Westinghouse Electric & Mfg. Co. will supply the switchboard equipment; the Babcock & Wilcox Co. the boilers and the Ingersoll-Rand Co. a turbo blower.

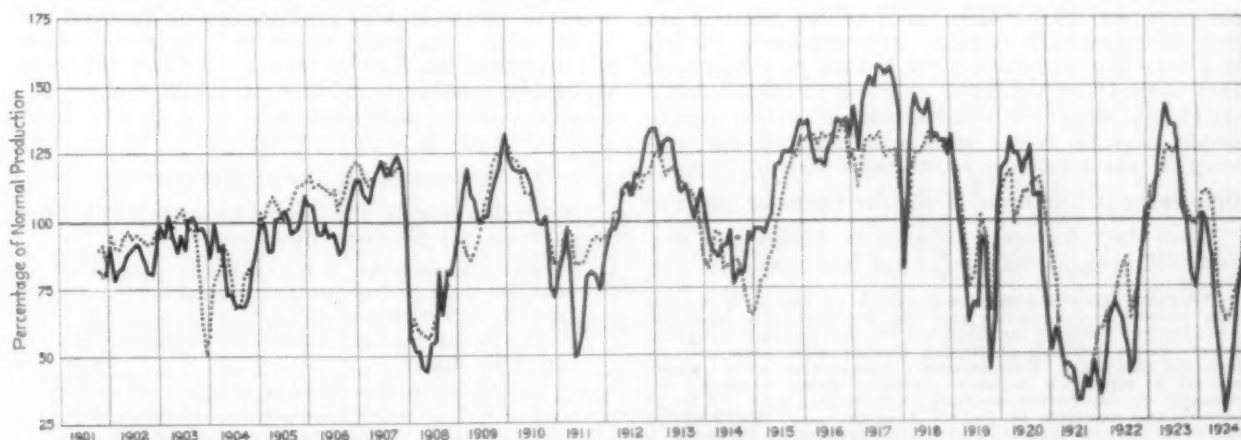


Fig. 6—Cyclical Index of Pig Iron Production in the Western Pennsylvania District (Solid Line) Compared With Similar Index for the United States (Dotted Line)

Some Fundamental Relationships

Cast Iron, Wrought Iron and Steel Manufacture— Effect of Repeated Remelting— Working Slags

BY J. E. FLETCHER*

ALL ferrous processes have much in common and the student who wishes to understand any one section of iron and steel works metallurgy is increasingly compelled to correlate the fundamentals of every other section. In particular, the relationships existing between the structural properties of cast iron, wrought iron, malleable cast iron and steel are of fundamental importance.

In Britain the monumental work of Henry Marion Howe is thoroughly recognized and in placing that indefatigable worker alongside our own John E. Stead, every English-speaking metallurgist and laborer in the field of iron works practice would seek to rival his fellow who have done most to further the all-around quest of knowledge and advancement in metallurgical science.

To Deal with Special Subjects

In this paper it is sought to cover only a few of the related areas in the field of ferrous research and to discuss them in such a manner as will suggest avenues to further thought and research of a practical character. The subjects touched upon may be briefly summarized as:

- 1.—Influences operating in the production of the common base of all iron and steel works and foundry processes, pig iron. Temperatures and other effects as responsible for differences in the chemical and structural composition of the blast furnace product. The fracture index and its relation to chemical and micro-structural analysis.
- 2.—Effect of remelting on the primary or pig iron structure and the relationship between the final structure of cast iron, wrought iron and malleable iron and the original pig iron structure.
- 3.—Function of working slags and their dominant fluid conditions and composition. The neutral and active conditions of the slags in various ferrous processes.
- 4.—Inter-relationships of micro-structure in cast iron, wrought iron, malleable cast iron and steels. Stable and unstable structures.
- 5.—The scrap problem and the influence of the increasing use of scrap in modern iron and steel making.

Blast Furnace Product

With the gradual deterioration of reworked scrap, the need for good virgin metal in the form of pig iron of dependable chemical and structural analysis is a necessary corrective. For it must be remembered that methods for desulphurizing and otherwise chemically improving the composition of scrap ferrous metals may be at the expense of the physical well-being of the structural constituents thereof.

Differences in Pig Irons of Similar Chemical Analysis

Two blast furnaces, differing in design and size, using different classes of ores and fuel, with dissimilar

*Birmingham, England; consultant to the British Cast Iron Research Association and the Wrought Iron Research Association. This is an abstract of the Annual Exchange Paper of the Institute of British Foundrymen, presented before the American Foundrymen's Association. The paper, one of a series on foundry problems being annually exchanged, is the fourth exchange paper presented by members of the Institute of British Foundrymen. Mr. Fletcher has been actively identified with the development of research in the British foundry and wrought iron industries. He acted as director of the British Cast Iron Research Association during the first two years of its existence and is now a member of its council.

driving rates and blast temperatures, may produce pig iron of like chemical analysis. The results obtained from the remelted pig iron, whether in the form of iron or steel castings, wrought iron bars or malleable castings may be, and often is, greatly different. Can it be expected that the pig iron produced in a small slow-working furnace smelting lean ores with cold blast shall have the same physical structure as another iron run from a large hard-driven furnace working on rich ores and using a hot blast?

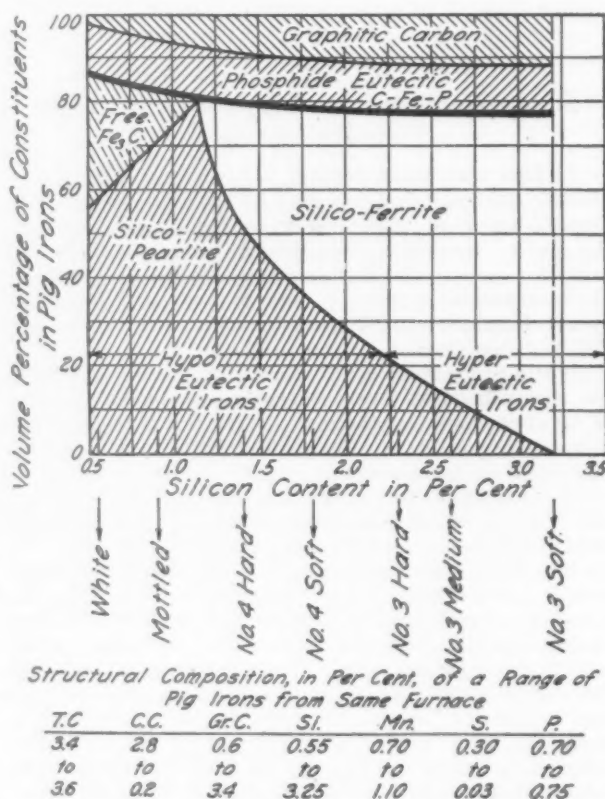


Fig. 1—Volumetric Analysis of the Constituents of Pig Iron, Varying with the Silicon Content

During the war period the shortage of hematite iron compelled blast furnacemen to charge steel and wrought iron scrap with high phosphoric ores and puddling cinder. In many cases the pig iron analysis approximated to that of well-known and celebrated cold-blast brands of foundry iron but the physical structure of the semi-steel type of iron was vastly different from the cold-blast variety.

Reasons for the Differences

There can now be little doubt that the chief differences lie in the following directions:

- 1.—Combustibility of fuel and rate of combustion per hour per square foot of furnace area at level of maximum combustion.
- 2.—Weight of air supply per pound of fuel burnt per hour.
- 3.—Weight of iron produced per hour per square foot of furnace area at maximum combustion level.
- 4.—Volume of ores or other metal-producing portions of furnace burden per cubic foot of gases at mean temperature between level of maximum combustion and furnace top exit—in terms of vol-

ume per square foot of furnace area at maximum combustion level per hour. This is a measure of the ore volume passing through one square foot of furnace area per hour during the reverse passage of 1000 cu. ft. of gas per hr. through the same area.

5.—Composition and temperature of the gases between level of maximum combustion and furnace top.

6.—Porosity and gas permeability factors of fuel and ore burden, involving lump size of ore and coke and porosity of the individual ore and coke lumps. Where high limestone or other flux additions are made the effect of flux lump size must be taken into account.

7.—Composition and volume of slag produced, in terms of slag weight and volume per square foot of furnace area at level of maximum combustion, per hour. Mean temperature of working slags and mean thickness of slag on metal in furnace hearth.

8.—Mean temperature of molten metal when tapped.

9.—Mean time period during which metal is accumulating in furnace hearth between tappings, together with mean depth of metal in furnace hearth.

10.—Character of various ores, etc., in mixtures and their distribution as charged. Reducibility and carburizing effect on various ores as affected by porosity or fineness of ores and by velocity of ascending gases and their composition and temperature.

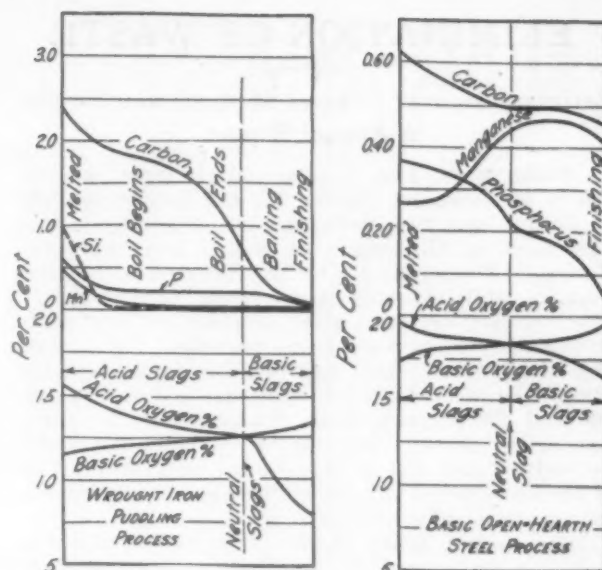
11.—Height of charge column, stock line to maximum combustion level; tuyere level to maximum combustion level; tuyere level to bottom of furnace hearth.

12.—Effect of blast velocity through tuyeres on air distribution. Oxidation in outer ring zones of charge column.

Difference in Blast Furnace Practice

As the problem is of vital importance to the foundryman, a few brief notes on differences in blast furnace practice may be of service. Take, for example, two blast furnaces making foundry iron of 2 per cent silicon, 1 per cent phosphorus grade; one more hardly driven than the other, the first making about 6 tons per working hour, the second 3 tons. The blast temperature in the first furnace is taken at 1200 deg. Fahr. and in the second 1000 deg. Fahr. Furnace No. 1 has a hearth 11 ft. 6 in. diameter and a height of charge column (from tuyere level to stock line) of 62 ft. Furnace No. 2 has a hearth 10 ft. diameter and a height of charge column of 60 ft. The iron content of the ores in No. 1 averages 25 per cent when calcined while that of No. 2 is 45 per cent. The slag produced per ton of iron in No. 1 is 3360 lb., that in No. 2, 2240 lb.; the coke consumption per ton of iron smelted being 3360 lb. in No. 1 and 3192 lb. in No. 2. From a closer examination of the furnace working the comparative data of Table I have been deduced.

To visualize what is happening while the ore is descending from the stock line to the hot zone in the furnace boshes, that is, the level of maximum rate of combustion, it is useful to conceive the iron oxide which is being reduced to metallic iron as in the form of grains of 1 mm. cube. In furnace No. 1 the lean ore,



Figs. 2 (Left) and 3 Show the Ruling Types of Slags in the Transition from the Meta-Stable to the Stable Neutral Compositions

24 per cent iron content, contains roughly one grain of iron oxide (Fe_2O_3) to 2.5 grains of earthy oxides, the mm. cube of iron oxide being coated by a 0.25 mm. thick film of silica, lime, alumina, etc. When the iron oxide is reduced to metallic iron, each 1 mm. cube of reduced

Table I

	No. 1 Furnace	No. 2 Furnace
Iron made per sq. ft. of furnace area at level of maximum combustion (8 ft. above tuyere level in No. 1 and 6 ft. in No. 2 furnace)	100 lb. per hr.	70 lb. per hr.
Coke burnt per sq. ft. of furnace area at maximum combustion level per hour	150 lb.	100 lb.
Ore volume passing per hour in terms of cu. ft. per sq. ft. of maximum combustion zone area	5 cu. ft.	1.3 cu. ft.
Hot gases passing each cu. ft. of ore per hour. Taken at level midway between maximum combustion zone and stock line	6900 cu. ft. at 950 F.	27,200 cu. ft. at 1050 F.
Mean velocity of burden descent from stock line to tuyere level	3.65 ft. per hr.	3 ft. per hr.
Metal rises in hearth at rate of	8.5 in. per hr.	5 in. per hr.
Mean thickness of slag blanket on top of metal in hearth	32 in.	19 in.
Temperature of throat gases	380 deg. F.	600 deg. F.
Weight of slag per sq. ft. of furnace area at maximum combustion level per hour	150 lb.	60 lb.

iron becomes surrounded by a jacket of slag-forming matter nearly 0.5 mm. thick.

Similarly, in Furnace No. 2 each 1 m. cube of iron

(Continued on page 1643)

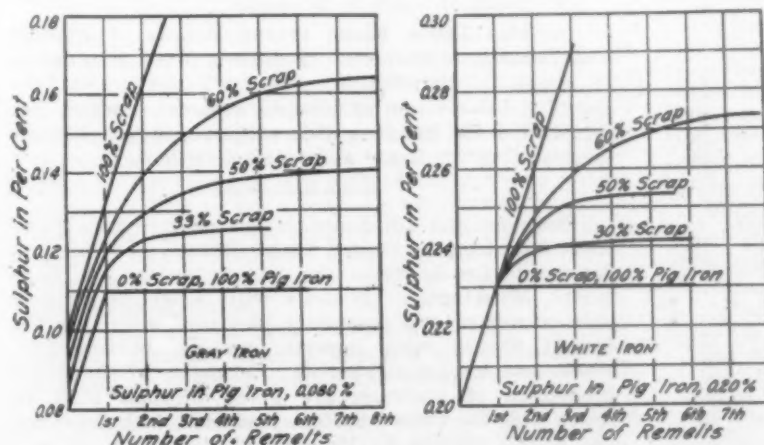


Fig. 4—Effect of Successive Remelting in Producing Pig Iron, on the Sulphur Content of the Iron, with Reference to the Proportion of Scrap Used

ELIMINATION OF WASTE

Secretary Hoover Stresses Methods and Results in Annual Report

WASHINGTON, Dec. 5.—The annual report of Secretary of Commerce Hoover for the fiscal year 1925 is divided into two parts, dealing respectively with "Processes in Elimination of Waste" and "Economic Review." The former section was released to the press Tuesday, while the latter part was made public Nov. 7. The secretary says that great progress has been made during the year in the national movement for elimination of industrial waste and that the department has devoted much of its activities to this end. He points out that the program is one fundamentally to stimulate action among industries, trades and consumers themselves, and that it is obviously not the function of the Government to manage business, but to investigate economic questions, etc.

Mr. Hoover again explains the philosophy that underlies the purpose of the plan, pointing out that it is intended to maintain American standards of living for both workers and farmers and to place production on a more stable footing. The term "elimination of waste," he states, is subject to some objection as carrying the implication of individual or willful waste. However, in the sense used in the discussions, elimination of waste refers wholly to those wastes which can be eliminated solely by cooperative action in the community.

Various methods of eliminating waste, again set forth, embrace a broad field, and the result shows one of the most astonishing transformations in economic history, the epitome of which lies in the report of the Department of Labor on the movement of wages and prices for 1920-1925. This report shows that, while wages are higher, taking an index number of 228 in 1924, against 199 in 1920 (1913 = 100) wholesale prices are lower, being 150 as against 226. Mr. Hoover makes comparisons with the British indexes, showing that these results are peculiar to the United States.

Statistics as a Guide

Director of the Census W. M. Steuart deals with elimination of waste by use of statistics and at some length sets forth the work developed by the bureau in this direction. He says that there has been hesitation in many trades at undertaking the gathering of current trade statistics and furnishing them to the Government, because of the lack of clarity in interpretation of the Sherman Act. In this connection he says:

These matters were clarified, however, by decisions which the Supreme Court handed down June 11, 1925, in the maple flooring and cement cases. These decisions supported the economic necessity of accurate statistical surveys, recognized their contribution to the public welfare, and held that in themselves such statistics constitute no infringement of the law. These decisions in no way relax the restrictions upon conspiracy to control price and distribution.

The importance of statistics as a contribution to the elimination of waste can be shortly summarized. Information as to the distribution of population, its character, and occupation, and as to industrial capacity, production, stocks and distribution, is vital to economy in the distribution trades and to judgment on increase in plant capacity and production. The whole system of production and distribution is improved just in the degree that supply and demand can be rightly adjusted. Underproduction creates scarcity and speculation; overproduction creates losses, suspension of industry and unemployment. Both violently affect price and widen the margin in distribution.

Industry is no longer local in its production and distribution, and the fundamental facts must be determined for the country as a whole and often for the whole world. Therefore knowledge as to productive capacity, volume of production, stocks, commodities and current consumption of every industry is vital if we are to have stable industry and stable profits without undue margins and speculation. Public informa-

tion as to these things is necessary to safeguard both the consumer and the producer.

Agriculture shares these benefits with all other industries. In fact, no industry so much requires the compilation of such statistics as does agriculture, for the many million units of production are less able to adjudge these currents than the larger units of other industry, with their larger contacts.

Large Construction Program Without Confusion

Director George K. Burgess of the Bureau of Standards discusses the elimination of waste, both in processes and in the construction industries. In cooperating with industries of the country, the bureau depends upon fundamental, scientific and technical data. As a result of the equipment built up during the war, the bureau today possesses the greatest physics and research laboratory in the world. Various industries, it is stated, have cooperated with the bureau in research designed to effect large savings in manufacturing, and especially by stationing at the bureau research associates working on fundamental problems. These research associates now number 63, as against 29 last year.

Dr. Burgess points out the far-reaching practical effect of better distributed construction, as determined during the past year. The amount of construction reached more than \$6,000,000,000, the highest in history. Large building programs have in the past usually meant rapidly mounting cost of construction. In this case, however, it is pointed out, there was a greater equalization of building activity throughout the 12 months and, as a result, an enormous construction program was executed with no marked labor shortage or serious pressure upon the building material manufacturer or transportation facilities. In fact, the price of most building materials decreased.

Standard Specifications Help

Specifications and business documentation, as a means of eliminating waste, were discussed by Dr. Burgess. The Federal Specifications Board, set up as a division in the Bureau of Standards four years ago to develop standard specifications, has now covered over 300 groups of items purchased by the Government. This has required investigation into physical qualities and manufacturing products, together with determination of tests to be applied in inspection. Specifications in every case have been submitted to cooperating representatives of industry, that they may be certain of their practical character.

Many State and public industrial purchasing agencies are now using Federal specifications, as are many industrial buyers. This is declared to have resulted already in large economies in Government purchases. In this connection Dr. Burgess said:

Adoption of more uniform specifications, formulated by cooperation between producers and consumers, tends to eliminate waste by (a) more positive competitive action, (b) more reliable standards as to quality and service, (c) more uniform demands upon manufacturers, (d) increased opportunity to manufacture to stock, resulting in more regular employment of plant and labor, (e) greater economy to the consumers, and (f) greater assurance of reliability in service.

Director Julius Klein, of the Bureau of Foreign and Domestic Commerce, in dealing with elimination of waste in distribution, sets forth the accomplishments of the division of domestic commerce, which was established for handling this subject and which deals largely with wholesale and retail distribution.

Platinum and allied metals are covered in a pamphlet issued by the United States Bureau of Mines and obtainable for 5c. from the Superintendent of Documents, Washington. It deals with American production of refined and secondary platinum metals in the United States, with imports, exports, consumption, stocks and market and prices. Estimates of the world production of platinum are given through 1923, in which year the United States stood fifth, with Colombia and Russia leading by long margins.

Ten Types of Open-Hearth Boils

Grouped from Dead Bath to Talbot Reaction— Uses and Occurrences of Each Class

BY HENRY D. HIBBARD*

ANALYZING the causes and effects of boils in the open-hearth furnace, the first section of this article led into the division of the whole gamut of boils into ten recognizable classes. These are discussed in detail in this and the succeeding (final) sections of the article.

1—Dead Bath

While a dead bath is uncommon, most open-hearth melters of considerable experience have seen instances. A bath is dead when no gas is being liberated by the metal, which phenomenon may be due to one of several causes, viz.:

- 1—Absence of carbon, the boil-producing element.
- 2—Absence of free or available oxygen which would oxidize carbon in the metal if it had access to it.
- 3—Presence in the metal of enough of an element such as silicon, which has great solvent power for the gases of steel and also, at the bath temperature, say around 1550 deg. (2820 deg. Fahr.), has greater affinity for oxygen than carbon has, while its own oxide is not gaseous.

The first two cases are extremely rare. Absence of carbon is likely to be due to either a mistake in the charge, not enough pig iron being included, or to excessively slow melting, due to poor gas or poor adjustment of the flame because of incorrect proportions of gas, air and chimney-draft, aided perhaps by cracks and openings in the brick work of the furnace. When no carbon is present in the metal, some crude iron, preferably molten, must be added to furnish some of that element, in quantity according to the percentage required in the product, with an excess to compensate for the carbon unavoidably oxidized and boiled out in finishing the charge.

If no free oxygen or iron oxide is present in the bath, or if the supply is inadequate to produce boil, iron oxide (ore) must be added in amount to give the desired action.

The third case of a bath without boil is met practically only in making, by the pig-and-scrap method, acid steel containing high carbon, or in the straight pig-and-ore method, now seldom employed. Both methods are referred to later. The silicon which kills the bath in this case may be the unoxidized remainder of that element in the original charge materials, or it may be in some silicon-bearing metal added later, particularly at or near the end of the operation. The first-mentioned case occurs only when there is a large percentage of crude iron in the charge and usually when it is added molten.

With all cold stock it practically occurs only in melting high-carbon acid steels, such as for springs and tools, having 0.90 per cent or more of carbon. In an acid bath with metal containing that proportion of carbon the presence of 0.30 per cent or more of silicon will usually cause it to lie dead without boil. The charge for such a heat must be so proportioned that, when melted, it is of the desired composition, as, excepting a part of the silicon, no elimination by oxidation of any non-ferrous element can be effected without causing boil. With that exception, the only way of varying the composition of such a dead bath is by dilution or addition.

If such a dead bath is desired to boil, large and, usually, repeated doses of iron ore must be added, especially at first, to oxidize the silicon, which can be

done only slowly, sometimes requiring hours. This is because the reaction takes place only along the surface of contact between the metal and the slag or lumps of ore, should there be any, and there is no motion to accelerate it.

Aluminum, also, will kill a steel bath if present in sufficient quantity, through its solvent power on the gases and also through its greater affinity for oxygen than carbon has at the bath temperature. This, though its calorific power is but 7200 calories per kilogram, as compared with the 8100 calories of carbon. In spite of this lower calorific power, aluminum is not reduced in notable quantity in the blast furnace and its affinity for oxygen, as compared with that of carbon, is not reversible at high temperatures, as is the case with silicon, noted later.

In the steel furnace, ladle and mold, aluminum has, weight for weight, many times (perhaps ten), the power of silicon for killing steel. It seizes oxygen as silicon does, and thereby deprives the carbon of it, but its great killing ability seems to lie chiefly in its great solvent power for the gases.

Titanium, if present in sufficient quantity, would probably give a dead bath, also, but no such case has come under the writer's observation except when the element was added at the end.

The case of silicon killing a bath is an instance of the effect of high temperature in changing chemical affinity. The calorific power of carbon when burned to CO₂, 8100 calories per kilogram, is greater than that of silicon when burned to silicic acid (SiO₂) which is 7595 calories. In the blast furnace at about or above 1900 deg. C. (3450 deg. Fahr.) this superior power of carbon is manifested by the plentiful reduction from its oxide of silicon, which alloys with or combines with the iron.

In the crucible steel process also, at temperatures probably between 1600 and 1650 deg. C. (2910 and 3000 deg. Fahr.), silicon is reduced from the acid slag and crucible walls in relatively small amount, by carbon in the metal and in the crucible itself. It enters the steel, keeping its gases in solution and so killing it. As much as 0.5 per cent of silicon may be so reduced.

A similar though less marked action takes place in the acid open-hearth furnace in making high-quality steel with medium or high carbon, when the charge is held in the furnace for a prolonged period without addition of ore, by which treatment 0.10 per cent of silicon or more is reduced and taken up by the metal. The temperature in this case may be somewhat under that of the crucible steel cited.

Still another instance bearing on this point is the case of an extremely hot Bessemer blow, when the carbon is practically all oxidized and so eliminated, while a large part of the silicon of the original charge remains unoxidized in the metal. This takes place at temperatures probably above 1650 deg. C. Cases in which such residual silicon amounted to from 0.6 to 1.4 per cent of the metal have been noted.

At the usual low temperature of the steel furnace these affinities are reversed, and silicon has greater affinity for oxygen than carbon has. The reaction is therefore reversible, by raising the temperature from somewhat below 1600 deg. C. to 1900 deg. C., and possibly to 1950 deg. C. This is represented by the formula:



That is not the real action of silicon in killing a bath of steel, as that element does not actually reduce

*Consulting metallurgical engineer, Plainfield, N. J. This is the second section of an article on Open-Hearth Boils. The first appeared Dec. 3, at page 1511.

CO₂ in the metal, but effects the same result by seizing the oxygen in the iron oxide it encounters, so that the carbon cannot have it. The temperature of equilibrium for this reaction is not known. In fact, such temperature may vary with changing conditions and environment.

2.—Almost Dead Bath

A bath almost dead has a few scattered bubbles, which show that carbon is being slowly oxidized, though not enough for the rate to be determined by analysis in any ordinary period of time. The carbon content remains practically stationary, as in the case of a dead bath. If the charge early in its history is nearly dead, it shows that the silicon content remaining in the metal from that in the charge is probably between 0.2 and 0.3 per cent, which is nearly but not quite enough to seize all the oxygen which reaches the metal, a little uniting therefore with the carbon, producing a few bubbles.

At or near the end, a bath may be nearly killed by the addition of solidifiers already mentioned, one or more. The lower the carbon the more gas solvent will be required to kill the bath, because of the greater amount of carbonic oxide held by the metal. For the same reasons as in the case of a dead bath, one almost dead is rarely if ever seen in a basic furnace, except when the metal is almost free from carbon. Thus the boil at the end of an ingot iron heat may be almost dead.

3.—Incipient Boil

An incipient boil indicates the presence in the metal of a noteworthy proportion of silicon, usually from 0.10 to 0.15 per cent. Substantially like the two classes already referred to, a bath with an incipient boil, if early in the history of the charge, is changing in composition very slowly. The silicon has been nearly all oxidized and the carbon is beginning to be, though at a slow, hardly measurable rate, as successive samples may show when analyzed in the usual way.

At the end of the heat, but before the final additions are made, an incipient boil of a medium or high-carbon bath shows the metal to be in exceptionally excellent condition for killing, which may be effected by minimum amounts of gas solvents. On the other hand, an incipient boil after the solidifiers are incorporated with the metal shows that the steel may not be quite killed, in which case it may contain in the ingot some harmful gasholes.

When silicon is high, as in these first three boils, an important amount of residual manganese is usually

present in the metal as well, though its effect is masked by the silicon.

4.—Gentle Boil

A gentle boil indicates an appreciable though slow oxidation of carbon, a silicon content below 0.1 per cent—perhaps not over half that—and sometimes around 0.2 per cent of manganese in the metal. Such a boil is proper for a high-quality medium-carbon heat to have, before the final additions are made. A bath of ordinary quality of partly killed steel of medium carbon usually has a gentle or moderate boil (No. 5) after the additions (made in the furnace) are melted.

For the highest quality of product that is too strong an action when the charge is finished and about to be tapped, for such a bath should be almost dead or, at most, have not more than an incipient boil. A gentle boil when the heat is tapped may, however, be right for high-quality steel, if further additions of gas-solvents are to be made in the ladle.

If a boil is below gentle, because of too little carbon present in the unfinished steel, it may be increased in vigor to moderate (No. 5) or even a stronger boil by the addition of enough crude iron, either solid or molten, to give 0.03 or 0.04 per cent additional carbon to the metal. The metal in such a case will be over-oxidized, to correct which special treatment will be called for.

5.—Moderate Boil

A moderate boil is a slow, but sometimes the most desirable, decarburizing boil, because with such that element goes out slowly. When carbon is desired within narrow limits in the finished steel, this boil is the best, at least near the end, when little remains to be eliminated. It is a suitable boil for partly killed medium and hard steels to have just before the first of the final additions, but is too active at that point for steel which is to be killed. It is too strong for either of these steels after the additions (made in the furnace) are melted, unless perhaps when more solidifier is to be added in the ladle or molds.

For low-carbon steels intended to effervesce in the molds a moderate boil at the end, before ferromanganese is added, either in furnace or ladle, is too mild, as it may result in the ingot having too thin skin and harmful skinholes. With residual manganese of 0.2 per cent or more in the metal, it may be difficult to give the bath a boil as strong as moderate.

(To be concluded)

Machine Tool Builders Win Advertising Prizes

At a convention at Atlantic City in October of the National Industrial Advertisers' Association there was an exhibit of industrial advertising. In the class for the best exhibit of industrial advertising, the first prize was won by the Kearney & Trecker Corporation, Milwaukee, and the second prize was won by Joseph T. Ryerson & Son, Inc., Chicago. In the class for the best institutional advertisement, the first prize was won by the National Machinery Co., Tiffin, Ohio.

Annealing Furnace for Foundry Use

For operation in a foundry making both steel and iron castings, the George J. Hagan Co., Pittsburgh, has installed an annealing furnace handling pieces varying in weight from ¼ lb. to 3000 lb. The furnace measures 5 ft. 4 in. in width, 4 ft. high, and 11 ft. 3 in. long inside, and is equipped with nickel chromium heating elements mounted along the side walls in two sections. Three 150-kw. transformers step down the incoming voltage to 220. Temperature limit fuses installed in the furnace near the thermocouples automatically open the power circuit at 1800 deg. Fahr.

For annealing steel castings the temperature runs

as high as 1650 deg. For the smaller quantities of cast iron handled the temperature is 1200 deg.—a figure reached at the rate of about 100 deg. per hr. The average weight of charge on the cars runs close to 8000 lb., with a maximum of 13,600 lb. The charge is held at temperature for about two hours, and then is cooled in the furnace to about 900 deg. before removal. As a new carload is run into the furnace as soon as the preceding load has come out, there is considerable conservation of heat. Total cost of operation is reported at 20c. per 100 lb., of which fixed costs and labor costs account for about one-quarter each, the power cost being nearly one-half.

Lehigh Valley Purchasing Agents

B. C. Sawyer, purchasing agent of the Bethlehem Fabricators, Inc., Bethlehem, Pa., has been elected president of the Purchasing Agents' Association of the Lehigh Valley. Other officers are: Vice-President, J. N. Noll, Tilghman-Moyer Co., Allentown, Pa.; secretary, A. J. Dion, Allentown Portland Cement Co., Allentown, Pa.; treasurer, N. P. Benner, Trexler Farms, Allentown, Pa. Mr. Sawyer is a member of the steel committee of the National Association of Purchasing Agents.

ROAD REINFORCEMENT

Investigations of Highway Research Board Cover Also Culverts

WASHINGTON, Dec. 8.—The economic value of steel reinforcement in concrete roads was outlined in detail here on Dec. 3 and 4 at the fifth annual meeting of the Highway Research Board of the National Research Council by C. A. Hogentogler of the board. The report was the result of an exhaustive survey of years covering from 2000 to 3000 miles of roads through the United States and is looked upon as being extremely valuable in the way of clearing up many moot questions as to the proper construction of concrete roads and the use of steel mesh and reinforcing bars. It was declared to have marked a new era in highway research and was part of the extensive program covering engineering and economic phases of concrete road construction.

The meeting was attended by 290 representatives of federal and state highway departments, research engineers and workers, engineering executives, iron and steel and road making machinery manufacturers, along with others.

The report by Mr. Hogentogler, illustrated with lantern slides, pointed out the economic value and efficiency of the different forms of steel used in building concrete roads. He showed where it could be best used under given road conditions, taking into account soil, subgrade and related elements, to avoid

cracks. All types of steel, it was pointed out, tend to hold the concrete together, but the value of the proper engineering methods employed in using the steel was emphasized.

A report also was made by R. W. Crum of the Highway Research Board on culvert investigation in connection with culvert pipe and small drainage structures. The field work in California has been under way for three months and about 2000 structures have been inspected. It is expected that the field work will be completed about Feb. 1, 1926, and cover inspections of at least 500 culverts. Samples from both the top and bottom of metal pipes will be taken for analysis.

Representatives of the iron and steel and related industries attending the meeting included the following: B. S. Pease, Perry T. Coons, Chicago; D. E. Hinman, A. S. Lutz and Charles T. Hvass, New York, American Steel & Wire Co.; E. D. Keil, and S. C. McKee, Toledo, Ohio; B. C. Briody, Youngstown, Ohio; and O. B. Young, Clarendon, Va., Truscon Steel Co.; E. L. Benedict, New York, National Steel Fabric Co.; W. S. Edge, Chicago, Concrete Steel Co.; S. J. Southwell, Wickwire-Spencer Steel Co.; E. S. Tavlorsen and J. C. Eckel, Pittsburgh; George W. Kirkley, Washington, American Sheet & Tin Plate Co.; C. L. Foster, New York, and D. B. Dimick, Birmingham, American Casting Co.; J. Thomas Hay, Canton, Ohio, United Alloy Steel Corporation; J. N. Heltzel, Warren, Ohio, Heltzel Steel Form & Iron Co.; W. T. Kyle, Bridgeport, Conn., Page Steel & Wire Co.; Arthur A. Levinson, Pittsburgh, Blaw-Knox Co.; William Ogden, Madison, Ind., Lakewood Engineering Co.; Edwin E. Powell, Towson, Md., Black & Decker Mfg. Co.

Ring Wheel Grinder Equipped for Rapid Grinding of Conduit Boxes

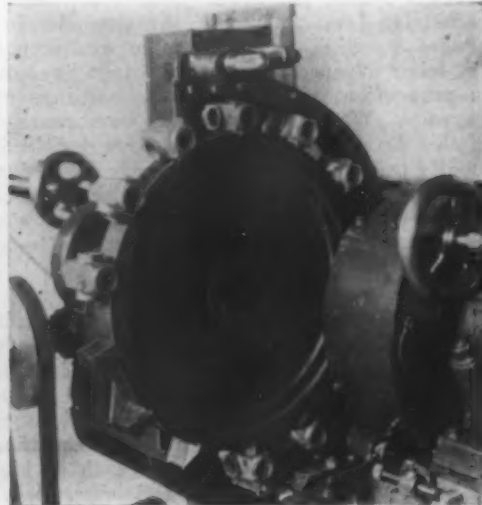
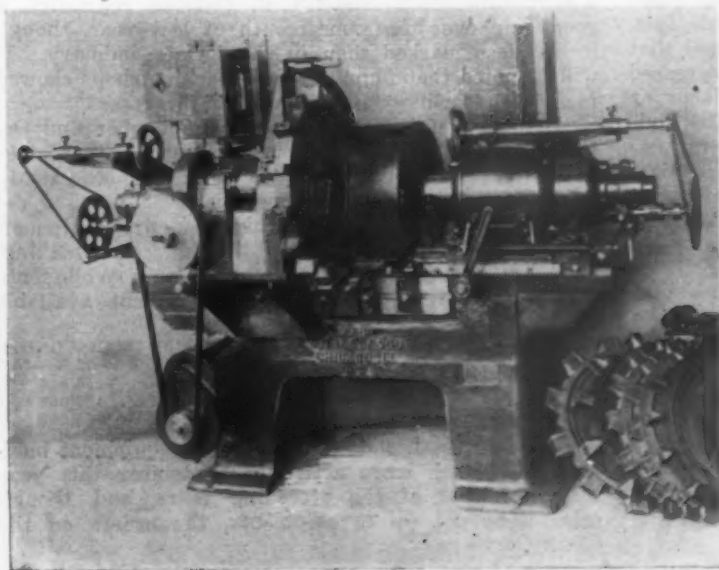
A ring wheel grinder equipped with a rotary type feeding disk, which permits the semi-automatic grinding of both ends and both side openings of Kondu conduit boxes simultaneously, is here illustrated. The machine, being built by Charles H. Besly & Co., 118 North Clinton Street, Chicago, is intended for grinding $\frac{1}{2}$, $\frac{3}{4}$ and 1 in. conduit boxes, it being claimed that 1600 to 2400 pieces may be finish ground per hour, the production varying with the size of the work.

The conduit boxes are of hard iron castings, and just enough stock is removed to get a clean surface. The side opening in boxes is used for chucking, the operator placing them on the projections on feed wheel as it revolves in front of him. The feed wheel carries the work over down between the grinding wheels and is dropped off at the bottom, finish ground both ends.

The rotary feeding fixture is a special unit and is

mounted on the company's standard No. 6 16-in. motor-driven ring-wheel grinding machine. The fixture is driven by means of a $\frac{1}{4}$ hp., 1800-r.p.m. motor through reduction spur gearing, belt and friction pulley and worm gearing to feed wheel shaft. The latter is mounted in a box type frame attached to tee-slotted pad on front side of machine base. The worm gear and shaft are hardened and ground and run in an oil bath. The feed wheel shaft is equipped with split removable bearings and take-up collar and wheel collar. Moving parts are dust-proof.

The feed wheels are secured to wheel collar on end of feed-wheel shaft with three cap screws, two wheels being required for each size box. These wheels are of gray iron, machined all over, and are equipped with hardened steel chucking blocks attached to their periphery. A circular spring pressure bar is mounted between the grinding wheels to hold the work in place while the grinding is being done. These bars are lined with removable hardened steel forms and may be replaced when worn.



Close-up of Special Feeding Fixture Is Shown Above; Complete Grinder at Left

Average Earnings of Manufacturing Labor Highest in Over Five Years

**Average Output of Manufacturers Also Reaches New Record;
Labor Productivity Gains Proportionately**

BY DR. LEWIS H. HANEY

DIRECTOR NEW YORK UNIVERSITY BUREAU OF BUSINESS RESEARCH

THE average output of the manufacturers in the United States reached a new high point in October. In fact, the October index materially exceeded the highest point reached at the peak of the 1923 expansion period, making due allowance for the usual month-to-month variations.

A glance at Fig. 1 will show how clearly the cyclical trend of business is revealed by the manufacturing data and how considerable an upswing has occurred since the bottom of the 1924 depression. We are now well along in a major cyclical upswing in business, with no reason yet in sight why expansion should not continue for at least five or six months more.

The employment of labor in manufacturing industries has also increased. Although the October gain

trend is clear, and October payrolls in the machine tool industry were the largest since April, 1924.

Another point worth noting is that the percentage of full-time operation has increased and returned in October to the level of spring 1924.

The price of pig iron shown in Fig. 2 is often barometric for machine tool trends. While recently pig iron prices have not changed much, the November average continued the general gains of the last three months, and judging by the past this means continued expansion for machine tools. In this connection, too, it may be noted that during November money rates average a little lower than in October and are still low enough to encourage some further expansion in the industry. It takes time for higher interest rates to

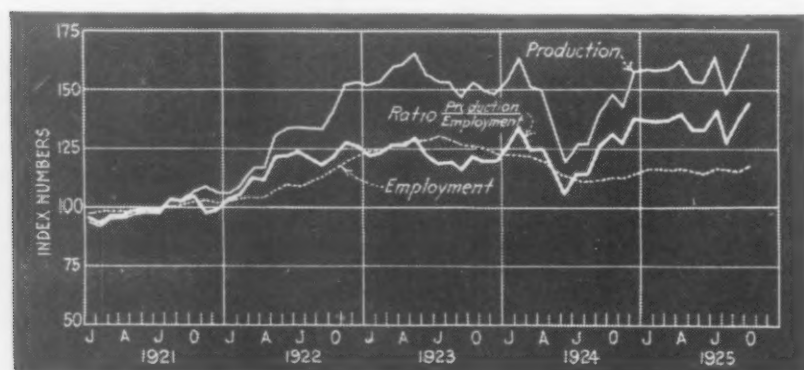


Fig. 1—Labor's Earnings, Production and "Real Wages" Are All at Peak Coincident With the Largest Average Manufacturing Production in Years

was partly seasonal, we estimate that there was an increase in employment of about $1\frac{1}{2}$ per cent in excess of the usual October movement. This brings the employment curve to the highest point reached since April, 1924.

The most significant fact, however, is that the output per employee in our manufacturing industries is breaking records. On the whole the tendency during the last five years has been toward a larger and larger average output per man. One of the most important industrial developments of the time lies in this fact. Wages are high, but labor is so well economized that the labor expense per unit of output has not increased in proportion to the per capita earnings of labor or payrolls. We do not appear to have reached the limit of this development, and with no major decline in commodity prices in prospect, it seems that better organization and a larger use of labor-saving machinery may well permit the maintenance of present standards of living among employees for a long time to come.

Machine Tool Improvement

THERE are presented this week two graphs (Figs. 2 and 3), which are of interest to those in the iron and steel industry. The machine tool industry showed rapid gains in September and October. After the usual August decline, both employment and payrolls made a strong recovery (Fig. 2). Last year these indexes rose in September, but did not reach as high a point as in the preceding July, and October made a little further gain. This year, however, a general upward

exercise their effect, and we are still under the influence of the past low rates.

Orders for machine tools in September were the highest since the 1923 peak. Reports indicate that October was still better, and that on the average November held the October gains fairly well.

Foundries Also More Active

AS in the case of machine tools, the foundry and machine shop industry in October registered a good gain over the same month of last year, though it was less marked than in the former industry. It will be noted that foundries and machine shops showed more of a decline the first half of this year.

Employment increased through September and October, and payrolls moved up sharply in the latter month. This was partly due to a considerable gain in the percentage of full-time operation.

The following data concerning foundry equipment (machines for molding, sand blasting, core making, etc.) are of interest in this connection. While only for September, they are the most recent available to us.

	Sales	Shipments	Unfilled Orders End of Month
Sept. 1923.....	\$246,000	\$328,000	\$440,000
Sept. 1924.....	219,000	335,000	327,000
Sept. 1925.....	296,000	351,000	544,000

The figures show that the foundry equipment business was much more active in September this year than in either of the preceding years, and, though sales were not up to shipments, the orders on the

In This Issue

Average output of manufacturing plants breaks record in October.—Labor productivity also gains; foundry and machine shop employment gains.—Page 1608.

President of labor federation says labor no longer opposes labor-saving machinery.—On contrary, workers desire to increase production and share in the increment, says William Green, who nevertheless opposes production-increasing cooperation by means of "company union."—Page 1597.

Industry's need of growing markets and steady consumption makes welfare of workers its chief concern.—As quality and quantity of production increases, labor must be able to buy, hence good wages are essential to industrial prosperity.—Page 1612.

Each worker really occupies three positions.—Teacher in regard to job he has graduated from, worker in present job and student in job he hopes to get: this can be made basis of promotion plan.—Page 1595.

Productive efficiency directly dependent on plant design.—Harold T. Moore suggests ten questions which should be answered before plant or layout is determined.—Page 1596.

Pig iron production in Pittsburgh district, 1902-23, increased less than 1/10 the average increase for country.—In Western Pennsylvania, high cost furnaces cause comparatively large fluctuations in annual output.—Page 1598.

Says sentiment for increased tariff on pig iron is gaining rapidly.—W. R. C. Alley says excess capacity of American furnaces changes aspect of low duties.—Page 1614.

No proof exists that business cycles move rhythmically, claims economist.—General cycles are not necessarily good barometers for individual industries.—Page 1618.

Ten common causes for breakage of mill rolls.—And how to guard against them.—Page 1587.

Shop analysis of CO₂ exhaled by workers furnishes guide to fatigue elimination.—Walter N. Polakov develops simple method for general industrial use.—Page 1596.

Moderate open-hearth boil useful in keeping carbon content within close limits.—With such a boil decarburizing takes place slowly; also suitable for partly killed and medium steels just before first of final additions.—Page 1605.

If sulphur content of open-hearth gases exceeds 3 gm. per cu.m., sulphur content of ingot also increases.—Addition of fluorspar counteracts this effect.—Page 1586.

Claims aluminum painting of patterns furnishes unusual protection.—Two lb. aluminum bronze powder used per gal. of shellac; said to waterproof and aid withdrawal from mold.—Page 1588.

Best materials for springs used for load carrying or recuperative purposes.—Are those capable of developing a broad range of stress without overstraining.—Page 1591.

Predicts that agricultural implement and machinery business will grow rapidly.—Influence of replacement orders will be much more strongly felt from now on.—Page 1579.

Makers of wrought iron, steel and castings must consume more scrap.—Growing use of direct metal from blast furnace to open hearth means larger proportion of scrap for remaining furnaces using solid charges.—Page 1644.

Combustion of coke in blast furnace said to take place in restricted area close to tuyeres.—Consequently the charge moves faster near the walls than in center of furnace.—Page 1585.

Supporting power of floating machinery foundation not necessarily proportional to depth.—Nor is anchoring floating foundation to pile or rock supported foundation good practice.—Page 1584.

Great possibilities in development of optical measuring apparatus.—Field of applications of four main types scarcely touched, says engineer.—Page 1583.

The Iron Age, December 10, 1925

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More Food: Fewer Farmers

BY a coincidence the first article in this issue deals with a matter discussed by President Coolidge in his speech before the American Farm Bureau Federation in Chicago this week. The President said: "For the last fifteen years urban population has been increasing, while farm population and the number of farms have slightly decreased. This has reversed the condition that existed before that period. But the real question is not the number employed, but the amount of production. If that should appear to be inadequate to meet our requirements . . . the situation might be serious. Such does not appear to be the case."

Why it is not the case and what the real facts are is the story of "Mechanizing the Farm: A Prophecy."

For News Summary See Reverse Side

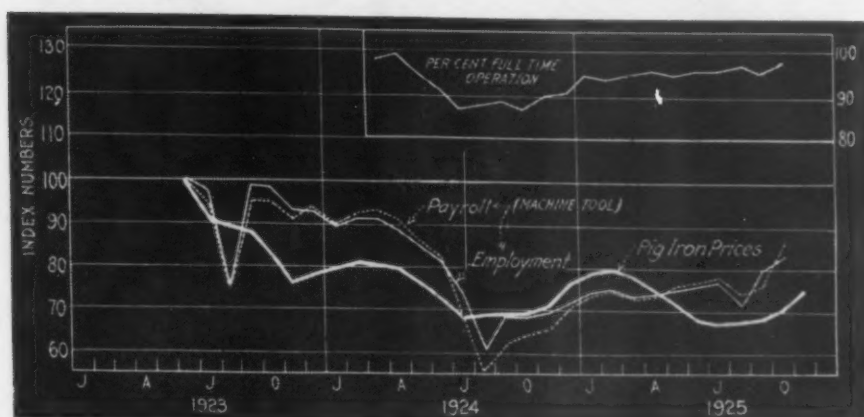
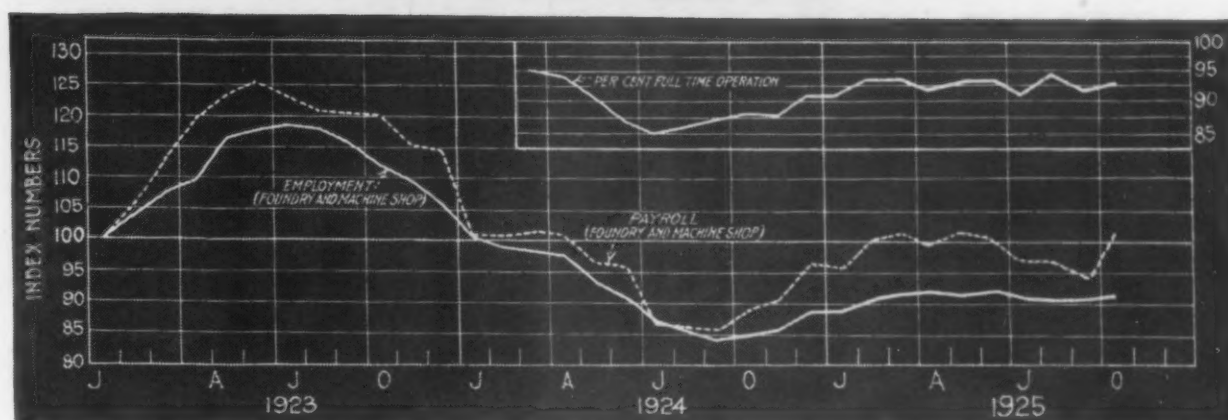


Fig. 2—Pig Iron Prices Are Often a Barometric Indication of Machine Tool Trends

Fig. 3—Foundry and Machine Shop Payrolls Showed a Decided Increase in October (Below)



books at the end of September were unusually large.

October reports from the Philadelphia district indicate a satisfactory condition among iron and steel foundries. Iron foundry shipments were large in comparison with production, and unfilled orders, while declining seasonally, were much larger than a year ago. Steel foundry operations did not make quite so good a showing, however, since shipments and unfilled orders were lower.

Employment Increases

THE average earnings of manufacturing labor in the United States increased sharply in October and were the highest in over five years. While the cost of living increased a little, the gain in earnings was so much larger as to indicate a real improvement in

the purchasing power of labor. Compared with a year ago earnings were about 3.8 per cent larger, while the cost of living had increased only about 2.8 per cent.

The number of employees reported for the iron and steel industry did not gain as much as usual in October, but the percentage of full-time employment increased sharply. The number of laborers employed by manufacturing industries as a whole in October showed a good gain above the usual seasonal movement.

We estimate that the value of iron and steel produced in October increased in comparison with payrolls in that industry and consequently that the trend of earnings was upward. The tons of iron and steel produced per employee continued the upward trend of the last few months.

The Iron Age, December 10, 1925

Leases Struthers Furnace

YOUNGSTOWN, OHIO, Dec. 8. — The Common Pleas Court of Mahoning County today granted permission to R. W. Grant, receiver for the Struthers Furnace Co., Struthers, Mahoning County, to lease the plant for four months at a monthly rental of \$1,500 to W. C. Holzworth, blast furnace superintendent of the Sharon Steel Hoop Co., Sharon, Pa. Mr. Holzworth and associates are developing plans to operate the furnace.

Expansion in Valley Operations

The Youngstown Sheet & Tube Co. will blow in during January one of its two inactive blast furnaces in the Hubbard group, Trumbull County, Ohio. The Carnegie Steel Co. has started an idle stack in its group at New Castle, Pa., giving it three active furnaces there. One furnace in the Ohio works battery, now being rebuilt, will be completed next month and blown in shortly thereafter. The Steel Corporation has 10 of its 14 blast furnaces in this district in action.

The Sheet & Tube company is adding to scrap purchases made several months ago. November shipments by this company were slightly under those for October. The Youngstown Steel Door Co., largely controlled by the Sheet & Tube company, has orders for 10,000 steel

doors, principally for railroad cars. The doors are manufactured by the Midland Products Co., Cleveland.

The resumption last week of Grace blast furnace in the Brier Hill complement of the Sheet & Tube company gives the district 25 active stacks out of a total of 43.

The Republic Iron & Steel Co. is averaging 85 per cent in operations and the Sheet & Tube company 90 per cent. Of 52 independent open hearth furnaces in the Mahoning Valley, 47 are active. Including the Steel Corporation units, 61 out of 67 furnaces are producing. Non-integrated sheet rollers are operating close to a capacity rate. The Newton Steel Co. continues to operate all of the 20 mills at its Newton Falls plant.

High Production of Ohio Foundries

The increase in activity of foundries has a quantitative indication in the report for October of the operations of the members of the Ohio State Foundrymen's Association. In that month the association records show that production was 25,002 tons, or 92.5 per cent of 27,020 tons, the figure corresponding to normal melt. The October operation proves to be higher than that for any month in some years. It compares with 84.3, the percentage for September, and 64.5, that for October, 1924.

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"Company Unions" and Organized Labor

LABOR'S new policy of cooperation with management to promote production was emphasized in an address by William Green, president of the American Federation of Labor, before the Taylor Society and the management division of the American Society of Mechanical Engineers in New York last week. The speaker made it clear that unionism is no longer opposed to labor-saving machinery, to the stopping of waste and to other methods of getting efficiency. On the contrary, he said, it desires to increase the fruits of industrial progress and to share in the increment.

This is a far cry from the old contention that labor as a submerged class is struggling for its rights against ruthless oppressors. It shows that union leaders are at last seeing what modern industrialism means—that its mechanizing of tasks, instead of depriving the workman of his livelihood, has given him improved conditions of employment and a higher standard of living. Greater production per man calls for increased consumption per man, because the development of mass output is possible only as industry finds wider markets for its products.

Some who have discussed the subject have challenged labor's right to share in gains due to advances in the art which capital and management have made. The realities of the situation, however, go beyond the question of equity. The necessity for markets determines that a substantial part of this increment go to labor. From time far back we have been saying that labor is needed to do the work of the world. Today we have more emphasis on industry's need of labor to consume its products.

Increased production depends not only on improvements in methods and equipment, but also on the will of employees to make changes that will increase their earnings. Producers are working constantly to win the confidence of their men. An effective means to that end has been the works council. It has refuted the old union doctrine that labor and capital are inevitably antagonists and has pointed out that the interest of employees and the success of the company are interdependent.

Mr. Green indicates that organized labor now

accepts the truth of that principle. Yet he is outspoken in condemning the works council, which is the principle in practice. He says:

The purpose of management which fosters the organization of company unions is clear and easily understood. The motive behind their action is a selfish one. It represents the desire for autocratic control and managerial domination.

Granting that the motive behind the works council is selfish, happily the selfish interests of the management dictate that the welfare of labor be subserved. The day is past when management will exercise "autocratic control and managerial domination" to oppress labor. It is not on the cards and Mr. Green knows it—if the major part of his address is to be taken at face value. Possibly his concern about the company union reflects uncertainty as to the future of organized labor.

In accepting the principle of cooperation fostered by the company union, the trade union is under the great disadvantage of following rather than leading. The question naturally arises whether the unions have taken this important advance step soon enough to win the allegiance of efficient workmen who long ago renounced the old policy of belligerency.

Training for Engineers

WILLIAM E. WICKENDEN, director of investigation for the Society for Promotion of Engineering Education, is reported as telling the Society of Mechanical Engineers at its annual meeting that in engineering the topmost rungs of the ladder are overcrowded, while the lower ones are but poorly filled; in other words, there is a hiatus between the apprentice in the shops and the consulting engineer. The consulting engineer himself will probably not agree with this conclusion.

To but few is given the quality of becoming a consulting engineer. There are many more who achieve success as operating engineers, as executives. Without discussing the differences in characteristics and functions, we may say that the men who are successful executives have been constrained arduously to climb the ladder and to burn much midnight oil while doing so; and in real life

there is no such thing as jumping from the technical school to the topmost rungs, with the result of leaving a row of unfilled rungs.

The engineering schools graduate many young men who have the intelligence to pass the scholastic tests and acquire the bachelor's degree, but who do not possess the engineering mind. Such men gradually pass out of the engineering profession and enter commerce and trade, and vocations for which they are better fitted. A surprising thing would probably be the ascertainment of the small proportion of engineering graduates who are practicing engineering ten years after graduation. On the other hand many of our great mining, metallurgical and manufacturing companies can exhibit healthy lists of young technical men who have donned overalls as workmen and have risen through the ranks of gang boss, shift boss, and foreman before acquiring shoulder straps as superintendent. Some of them eventually will become general managers and a few will be presidents and consulting engineers.

John Lyle Harrington at the same meeting expressed a sound view when he said that the tendency toward lengthening technical education at the expense of the arts is passing, and more and more are engineers realizing the necessity of a training in the humanities. The theories should be learned in the schools; the practical side of engineering will be gained by experience. Many eminent engineers will assent to the declaration that the applicant for admission to the engineering school should be required to present evidence of an old-fashioned high-school course, including Latin.

A Way Out for British Steel?

F. SCARF, managing director of the Bromford Iron Co., West Bromwich, England, writes to the *Manchester Guardian Commercial* on a "Remedy for Steel Trade Troubles." He is against the protective tariff proposal that has been to the front in Great Britain in the last two years. His main objection is that a tariff would raise the cost of living, the rate of wages, and thus the cost of production in Great Britain, losing for the British steel trade a good part of the 70 per cent output now going abroad. He is not greatly concerned over the British position in respect to the four essentials of cheap steel making—ore, coal, scrap and labor. While British wages are 40 per cent higher than those on the Continent, the Continental labor is less efficient.

What Mr. Scarf particularly emphasizes is that the British output of pig iron has hung at about the same point since 1880, while chief competing countries have gone forward by leaps and bounds. He calls the output of British blast furnaces miserably low—an average of 40,000 tons a year per furnace, as against 60,000 tons in France and Belgium and 170,000 tons in the United States. Relatively small use is made of blast furnace gases in Great Britain. Only one-third of the pig iron used for steel making is charged hot.

Modern plants and methods will get the British steel trade out of its troubles, Mr. Scarf believes; the tariff will not. "It is quite obvious," he concludes, "that unless costs can be seriously reduced

a large portion of our steel trade must leave us." On the other hand, "with works fully modernized, the smaller and inefficient plants scrapped and the orders concentrated in the better, larger, self-contained works," it would be possible to meet competitors on equal terms.

Mr. Scarf has visited American steel works and knows what has been done on this side in recent years to secure economical production. One phase of the subject he does not discuss; that is the response American engineers and manufacturers of modern iron and steel making equipment have had to all the proposals they have made since the war to British owners and executives. In substance it is that the directorates of British steel companies fear that, even though they spent millions of pounds on the modernizing of their plants, there would be no certainty of getting any larger share of the world's steel trade than they have today. Indeed, that counsel of defeat has spread widely through the British industry. Thus the question reduces to one of finding a remedy for the state of hopelessness into which many leaders in the British steel industry have fallen.

Idle Bessemer Steel Capacity

THE fact may not be generally recognized that there are exact statistics available of the monthly production of Bessemer steel ingots. By comparing the monthly reports of the American Iron and Steel Institute for 1924 with the annual report for the year it is seen that there is practically no Bessemer tonnage that is not reported monthly. The production reported annually but not monthly is chiefly open-hearth. Differences between the respective tonnages reported for the year and reported by months are as follows, in gross tons:

	Made	Reported Monthly	Difference
Open-hearth ..	30,717,981	28,811,331	1,907,000
Bessemer	5,846,153	5,836,194	10,000
All other	247,073	108,506	139,000

Thus it appears that substantially all the Bessemer steel ingot production is reported monthly (10,000 tons missing out of six million). A contribution may be made, therefore, to the discussion under way as to what our real ingot producing capacity is. If there is much useless equipment carried as Bessemer capacity an indication of the fact can be obtained.

The total steel ingot capacity reported to the institute, shown on page 31 of the annual statistical report, is, for Dec. 31, 1924, 58,438,420 tons. That this is theoretical rather than practical is of course well known, and the figure often used by THE IRON AGE of 54,000,000 tons as the practical commercial capacity makes an allowance for this. The Bessemer capacity reported is 11,407,050 tons, which is 19.5 per cent of the institute's total of 58,438,420 tons. It would be 10,530,000 tons, on the basis of 54,000,000 tons total capacity and the 19.5 per cent ratio.

Having learned by the comparison of 1924 figures that substantially all the Bessemer ingot output is reported monthly, we find the Bessemer production for the ten months of 1925 was 15.2 per cent of the total. Thus when 19.5 per cent of the total reported capacity is given as Bessemer and

actual production is only 15.2 per cent, there is a discrepancy. The Bessemer capacity has not been so fully engaged this year as the open-hearth.

Let us see what importance this discrepancy possesses. The Bessemer production reported for the ten months was equal to an annual rate of 6,600,000 tons, which is 62.5 per cent of 10,530,000 tons. The total production in the ten months was equivalent to an 80 per cent rate on 54,000,000 tons. If Bessemer had been at 80 per cent instead of 62.5 per cent the total production of ingots would have been 4.2 per cent greater than it really was.

The probability is that capacity in Bessemer is not in precise alinement with the natural preferences of steel buyers. The reserve is more in Bessemer than in open-hearth. With Bessemer capacity reported at one-fifth (19.5 per cent) of the total, it could be said, when the total operation is 80 per cent, that more than one-fifth of the idle 20 per cent is Bessemer.

ASSERTING that no one who has studied the question carefully can view with equanimity the present condition of the British iron and steel trade or can regard its future with anything but the gravest anxiety, a commentator in the *London Iron and Coal Trades Review* concludes that while domestic business is reasonably maintained, "our foreign trade is in a sad state, and until this revives the steel industry will have to continue working at about two-thirds capacity." This year's exports, which averaged 298,800 gross tons per month up to Oct. 31, will be the smallest in the last three years and only 72 per cent of the volume of 1913. Pig iron and steel production this year will be the smallest since 1922.

The Anthracite Deadlock

GOVERNOR PINCHOT intervened in the anthracite strike, as it was expected he would do, making a proposal which Mr. Lewis said was fine, which Mayor Hylan applauded, and which the operators promptly rejected, in view of its long-term tie-up, its camouflaged check-off and some other features.

On the eve of the assembling of Congress Senator Borah and other legislators were talking of legislation enabling the Federal Government to take over and administer the anthracite mines in times of trouble. They do not say how they are going to enable the Federal Government to override the State of Pennsylvania or compel the latter to repeal its law which practically limits to the union the right to mine anthracite coal.

The consuming public is more or less indifferent, having learned how to burn bituminous coal and incidentally that anthracite is a convenience rather than a necessity. The New England consumer who had to pay \$16 per ton for anthracite, pre-strike, is now supplied with good soft coal at \$10. He finds that the soft coal keeps him warm and does not make excessive smoke or soot if he burns it intelligently.

Mr. Lewis, trying to bamboozle the public into coercing the operators, first warned us that we should freeze to death and then that we should asphyxiate ourselves. No mortality either way has

yet been reported. It looks as if the chief sufferer from the strike is going to be Mr. Lewis himself. The fate of the unsuccessful labor leader is seldom enviable.

Anthracite operators and miners are partners in a controlled industry who have pursued the policy of charging all that the traffic would bear. In their quarreling over division of the profits the operators have had the better vision and have warned of the risks that the industry was courting by being too exorbitant. Their warnings were not altogether Cassandran, though the miners' leaders wanted the public so to regard them. When the anthracite industry resumes production again it is going to be to supply a market whereof a large part will continue lost.

ELECTRIC ferromanganese made outside the United States is evidently gaining in favor with American steel makers. Until a year or so ago the domestic and foreign blast furnace product predominated. The electric alloy is made both in Norway and Canada. In the ten months ended with October this year more than 5000 tons was imported from Canada and nearly 8000 tons from Norway. The largest imports were in October—986 tons from Canada and 4260 tons from Norway. The total of 13,000 tons is more than 21 per cent of the ten months' imports, the official figures representing the manganese content in the 80 per cent alloy. The figures are an interesting comment on the cost of the foreign electric alloy. In this country domestic ferromanganese made in the electric furnace has always disappeared from the market as soon as the price fell much below \$150 per ton. The Norwegian and Canadian furnaces, however, can now market their product in this country at \$115 and pay a duty of over \$33 per ton, and it need not be thought that they do it at a loss. When American electric power can be had as cheaply as that abroad, our development in electrometallurgy will come on at a new pace.

CORRESPONDENCE

Pig Iron Imports Controlled by Economic Law, Not by Duty

To the Editor: During the infancy of the iron industry and in its early stages of development in the United States, the demand for pig iron was in excess of supply and foreign iron was imported to effect stabilization. As supply and demand approached an equilibrium, less foreign metal was needed for readjustment. Whenever economic factors threw them out of alinement and demand was in the ascendancy, foreign iron was always available to close the gap.

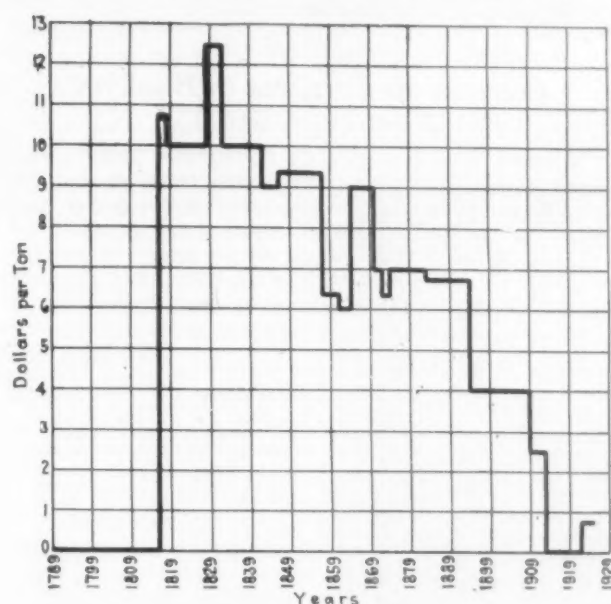
A foreign commodity affecting so vital an industry must, perforce, receive Governmental consideration. However, it was not until 1816 that Congress deemed it advisable to afford some protection to domestic pig iron manufacture. In order to foster its growth as much as possible, it established in the tariff of that year a duty of 20 per cent ad valorem. This action inaugurated a strong protective policy which continued in effect until 1894, when the first important break occurred, the duty being reduced from \$6.72 to \$4 per ton, an impost which continued unchanged until 1909.

In the preparation of the 1909 tariff act, Eastern furnaces took a firm stand against any lowering of the

existing duty of \$4, their position being ably set forth by an eminent iron merchant of that time as follows:

"The experience of 1908 would indicate that any lowering of the duty of \$4 per ton on pig iron would jeopardize your investment (that of blast furnace stockholders). With only about 33 per cent of the American furnaces in operation during the greater part of 1908, foreign iron was only prevented by the \$4 duty from competing with us in the Eastern seaboard market, and still further adding to the distress."

Despite this opposition the duty was reduced to \$2.50 per ton, which remained in force until 1913, when pig iron went on the free list, thereby ending a 97-year



Import Duties on Pig Iron Graphically Shown

period of protection. In 1922 a duty of 75c. per ton was imposed and is now in force.

The United States tariff policy on pig iron is shown in Table I and graphically above. It can be characterized as firm until 1894, when a reaction set in culminating in the elimination of any duty in 1913. The pendulum started to swing slowly back in 1922 with the imposition of the present inadequate duty of 75c. per ton and public sentiment for a higher impost is gaining momentum rapidly.

Foreign iron, in the writer's opinion, should not

Table I
Import Duties on Pig Iron*

Act of	Rates of Duty, Specific and Ad Valorem
1816.....	20 per cent ad valorem
1818.....	50c. per 112 lb.
1828.....	62½c. per 112 lb.
1832.....	50c. per 112 lb.
1842.....	\$9 per ton
1846.....	30 per cent ad valorem
1857.....	24 per cent ad valorem
1861.....	\$6 per ton
1864.....	\$9 per ton
1870.....	\$7 per ton
1872.....	90 per cent of existing duties†
1874.....	\$7 per ton
1883.....	3/10c. per lb.
1890.....	3/10c. per lb.
1894.....	\$4 per ton
1897.....	\$4 per ton
1909.....	\$2.50 per ton
1913.....	Free
1922.....	75c. per ton

*Period 1789 to 1815, pig iron on free list.

†Equivalent to \$6.30 per ton.

be permitted to dominate so vital an American market, as constructive competition is impossible when it is based on radically different economic structures. Fundamentally, foreign iron imports are regulated through economic law, as a tariff exerts only a variable influence. That an impost, within reasonable limits, does not bar foreign iron when needed, may be gleaned from Table II, and that a duty of itself does not necessarily regulate the rate of inflow, is shown in Table III.

It is apropos, however, to point out at this juncture that conditions in the distant past have been very different from those existing in the more recent past. Over a long period, demand exceeded supply in this

country and even after proper adjustment in relationship occurred, the reserve capacity was lacking for some time to meet any abnormal demand of a "boom" era. At the same time, economic conditions both here and abroad were more nearly in harmony. Stability and permanence were the outstanding characteristics of the

Table II
Influence of Economic Law on Rate of Inflow—
Variations in Imports in Years When
Duty Was Unchanged

Duty per Ton	Imports in Tons	Change in Tons	Year
\$7.00	66,504		1878
7.00	304,171	+ 237,667	1879
7.00	700,864	+ 396,693	1880
6.72	322,648		1883
6.72	184,269	— 138,379	1884
6.72	146,740		1885
6.72	361,768	+ 215,028	1886
4.00	414,981		1903
4.00	49,219	— 365,762	1904
2.50	93,740		1910
2.50	38,685	— 55,055	1911
Free	26,794		1921
Free	379,521	+ 352,727	1922

Actual tons pig iron; figures for previous years include ferroalloys.

business structure throughout the world. The tariff, acting as a controlling agent up to a certain safety limit, extended to American pig iron manufacture the assistance needed for healthy, vigorous and expanding life.

Of late this situation has taken on an entirely new aspect. Domestic supply is well able to take care of any normal demand, with reserves in all probability fully able to cope with any abnormality which might arise. In fact, supply has been in excess of demand and matters have been seriously complicated by foreign

Table III
Effect of Tariff Changes on Rate of Inflow

Duty per Ton	Imports in Tons	Change in Tons	Year
\$7.00	219,228		1871
6.30	264,256	+ 45,028	1872
6.30	138,132		1873
7.00	54,612	— 83,520	1874
7.00	540,159		1882
6.72	322,648	— 217,511	1883
6.72	54,393		1893
4.00	15,582	— 38,812	1894
4.00	32,784		1908
2.50	57,831	+ 25,047	1909
2.50	18,386		1912
Free	23,586	+ 5,200	1913
Free	379,521		1922
0.75	367,878	— 11,643	1923

Actual tons pig iron; figures for previous years include ferroalloys.

competition. Foreign pig iron enjoys many advantages over American iron in its bid for patronage here. Low production costs due to a different economic standard, low ocean freight rates, exchange rates, low inland freight rates to consuming points near the American coast, the small duty, etc., all favor it.

In addition, home conditions in some foreign countries make an outlet abroad most desirable, if not absolutely necessary, for surplus pig iron production.

It has been well said that pig iron is a true index or barometer of trade, for the reason that its production is very widely scattered and competition is unrestricted. It is therefore a vital and important cog in our industrial life which consists of a number of interdependent component parts, all of which react upon each other. One member cannot be adversely affected without injuring business as a whole to some extent, and a reversion to our successful protective tariff policy of the past seems most advisable.

WILLIAM R. C. ALLEY,
Alley & Page.

New York, Dec. 1.

SIMPLIFYING DIE HEADS

Reduction of Stock Sizes of Chasers Suggested by Conference

WASHINGTON, Dec. 8.—Effective April 1, 1926, and to continue for one year, a reduction of 75 per cent in the sizes and varieties of chasers for self-opening die heads was determined upon here at a general conference last Friday, Dec. 4, of manufacturers, distributors and users held under the auspices of the Division of Simplified Practice of the Department of Commerce. From 600 to 750 tons of high-speed steel are used annually in making these chasers which are employed in automatic screw machinery in the manufacture of a wide range of parts for sewing machines, locomotives, typewriters, automobiles, electrical fittings, etc. It is estimated that the program adopted will net a saving of \$500,000 a year in manufacture and distribution, with a much larger indirect saving to every user of machine screws through interchangeability of parts.

The simplification was in line with work done by the National Screw Thread Commission and the American Engineering Standards Committee. These organizations, along with the American Railway Association, the American Electric Railway Association, the American Society of Mechanical Engineers, machinery interests, die manufacturers and others were represented at the meeting. A standing committee comprising representatives of the manufacturers, the machine tool builders, mill supply dealers, and large consuming groups will be named to observe the application of the simplification program, to receive suggestions and to develop, if possible, further eliminations.

Ralph E. Flanders, general manager of the Jones & Lamson Machine Co., Springfield, Vt., who was head of the committee that made a survey looking to the possible simplifications, cited examples of his own firm which stocks 1050 items and said that two-thirds of these items do not turn over in less than one year, while in some items four years are required. He said that it is the experience of his company and that it is more or less general that 50 per cent of the chasers are ordered as specials. Standard chasers, he pointed out, can be made with more accuracy and care.

The tentative list of suggested stock sizes of simplified chasers for self-opening die heads is given in Table 1. Other tables showing sizes to be stocked but to be discouraged; threads for electrical fixtures and fittings; railroad sizes; and National pipe thread, straight and taper, have been drawn up.

Suggested List of Regular Stock Sizes of Chasers for Self-Opening Die Heads

From the National Coarse-Thread Series		From the National Fine-Thread Series	
Size	Threads Per Inch	Size	Threads Per Inch
5	40	8	36
6	32	10	32
8	32	12	28
10	24	14	24
12	24	16	24
14	20	18	20
16	18	20	20
18	16	22	18
20	14	24	16
22	12	26	14
24	11	28	12
26	10	30	11
28	9	32	10
30	8	34	9
32	7	36	8
34	6	38	7
36	5	40	6
38	4	42	5
40	3	44	4
42	2	46	3
44	1	48	2

*Interchangeable with size 24—24.
 **Interchangeable with size 14—20.
 †Interchangeable with size 16—32.

Among those attending the conference held at Department of Commerce, Dec. 4, were: Henry S. Beal, representing the Jones & Lamson Machine Co., Springfield, Vt.; H. W. Bearce, National Screw Thread Commission, Washington; J. G. Benedict, Landis Machine Co., Waynesboro, Pa.; C. W. Bettcher, Eastern Machine Screw Corporation, New Haven; W. J. Burger, Warner & Swasey Co., Cleveland; C. K. Chapin, Murchey Machine & Tool Co., Detroit; H. J. Crain, Packard Motor Car Co., Detroit; R. H. Dalgleish, Capital Traction Co., Washington; also American Electric Railway Association; A. G. Follette, Pennsylvania Railroad, also purchase and stores division American Railway Association;

E. G. Herndon, Bureau of Engineering, Navy Department; James W. Hook, Geometric Tool Co., New Haven; C. E. McArthur, Modern Tool Works, Erie, Pa.; F. C. Nichols, Navy Department, Washington; F. Dana Payne, Modern Tool Works, Erie, Pa.; E. C. Peck, American Society of Mechanical Engineers, Cleveland; August A. Rickert, Rickert Shafer Co., Erie, Pa.; J. W. Sneyd, Geometric Tool Co., New Haven.

R. M. Hudson, chief of the Division of Simplified Practice, was present, as well as E. W. Ely and E. L. Priest, also of the division.

Capacity of Furnaces in Blast on Nov. 1 and Dec. 1

Because blast furnace data for October and November were collected almost entirely by wire, it was impossible to publish in the first issue of November and December the usual table of capacity in operation on the first of the month. From confirmatory data later received the following table has been prepared showing the number of furnaces in blast on Nov. 1 and Dec. 1, together with an estimate of their capacity per day:

Coke Furnaces in Blast					
Furnaces	Total	Dec. 1		Nov. 1	
		In Blast	Capacity per Day	In Blast	Capacity per Day
New York:					
Buffalo	21	12	5,595	12	5,495
Other New York....	5	1	305	1	295
New Jersey	4	0	....	0	....
Pennsylvania:					
Lehigh Valley	12	6	2,555	6	2,650
Spiegel	2	2	320	1	165
Schuylkill Valley ...	15	6	2,175	6	2,160
Lower Susquehanna..	8	3	1,395	2	895
Ferromanganese ..	1	1	65	1	70
Lebanon Valley	4	0	....	1	220
Ferromanganese ..	2	1	85	1	80
Pittsburgh District..	52	42	23,050	37	20,470
Ferro and Spiegel..	4	3	460	2	355
Shenango Valley ...	15	8	4,145	8	4,995
Western Pa.	19	8	3,600	7	3,240
Ferro and Spiegel..	2	1	160	1	155
Maryland	5	5	1,935	5	1,965
Ferromanganese ..	1	0	....	0	....
Wheeling District ...	14	8	3,685	9	4,130
Ohio:					
Mahoning Valley ...	28	16	8,990	16	9,030
Central and Northern	22	18	10,200	19	10,570
Southern	13	5	1,625	5	1,575
Illinois and Indiana..	42	31	19,020	28	18,095
Mich., Wis. and Minn..	12	8	3,075	8	3,110
Colo., Mo. and Utah...	7	4	1,695	3	1,270
The South:					
Virginia	16	1	140	2	360
Ferromanganese ..	1	0	....	0	....
Kentucky	7	1	....	1	380
Alabama	35	25	8,380	21	6,875
Ferromanganese ..	1	1	80	1	65
Tennessee	12	3	365	2	280
Total	382	220	103,100	206	97,950

Government Manufacturing and Business Activities Opposed

WASHINGTON, Dec. 8.—Officials of more than 100 trade associations, it is stated, will take part in the mass meeting to be held here Dec. 10 and 11 to institute a campaign against competition with industry by Federal, State, county and city governments. Surveys by the steering committee appointed at a preliminary meeting held here several weeks ago show various governmental units to be particularly active in the following types of manufacturing and business operations: warehousing; insurance; shipbuilding; printing; building; the manufacture of clothing, firearms, saddlery and harness, shoes, metal furniture, explosives; and the handling of cement, sand, gravel and brick and grain.

Among the national organizations that will be represented at the conference are the following: Council of American Shipbuilders; American Institute of Steel Construction; American Mining Congress; National Association of Sheet and Tin Plate Manufacturers; National Brick Manufacturers Association; Pacific American Steamship Association; National Association of Manufacturers.

LONG AN IRON AGE EDITOR

George W. Cope's Many Years of Conspicuous Service in the Iron Trade

GEORGE W. COPE, for more than 30 years one of the editors of THE IRON AGE, died at his home in Philadelphia on Thursday, Dec. 3. After 15 years' service in the New York Office as a directing editor of the paper, he retired in 1917 and soon afterward removed from Flushing, L. I., to Philadelphia.

Both in the length of his career in iron trade journalism and in the high character of his service to THE IRON AGE and the industries it represents, Mr. Cope had a unique distinction. His connection with the iron trade began in the day of small things in the industry as well as in industrial journalism. From a pig iron output of about 2,500,000 tons in 1873, the year in which Mr. Cope entered the service of the American Iron and Steel Association, he saw the figures grow under alternating setbacks and advances until in the last year of his editorship of THE IRON AGE they were 15-fold larger.

Born at Norristown, Pa., on April 9, 1847, his early life was spent there and at Johnstown, Pa., where Mr. Cope taught for a number of years, becoming superintendent of the city schools. At Johnstown also he read law in the office of the late Judge Cyrus L. Pershing. Judge Pershing removed to Philadelphia and Mr. Cope at the same time took up his residence there, having been admitted to the bar. At the opening of 1873 James M. Swank, whom Mr. Cope knew at Johnstown as editor of the *Tribune*, had been called to Philadelphia as secretary of the American Iron and Steel Association. As the work of that office broadened, Mr. Swank invited his whilom Johnstown friend to become assistant secretary and Mr. Cope entered the office of the association before the close of Mr. Swank's first year. In the ten years following he was an occasional contributor to THE IRON AGE and in 1883 he came from Philadelphia to become associate editor of this journal. Iron market reporting was then only in embryo. The careful and intelligent cultivation it had at the hands of Mr. Cope and others did much to put it on the substantial and authoritative basis on which it is conducted today. In the minds of men in the iron trade who are now past middle life the names of Kirchhoff, Cope and Hobson are connected with the development of the market reviews of this journal to the high plane of the past quarter of a century. The character of their foundation work may be judged from the fact that for years IRON AGE market quotations have been made the basis of settlements involving millions of dollars annually.

In 1885, after two years as associate editor of THE IRON AGE in New York, Mr. Cope resigned to become secretary of the American Iron and Steel Association at Philadelphia, Mr. Swank having been elected at that time general manager. In January, 1887, Mr. Cope accepted the position of western editor of THE IRON AGE with headquarters at Chicago. In his 15 years at Chicago as western editor he represented all

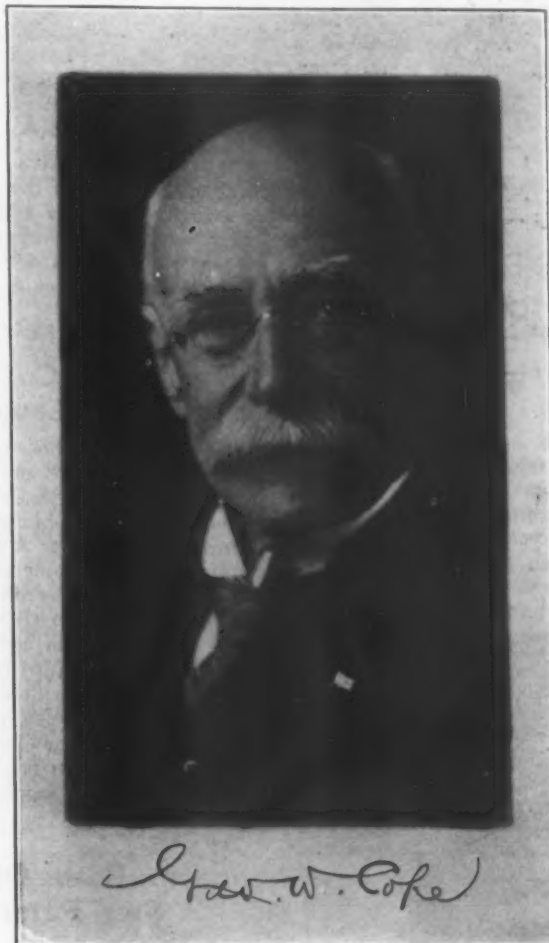
the David Williams' publications, including *Metal Worker*, *Carpentry and Building*, and the hardware department, then incorporated in THE IRON AGE, but which in 1910 became a separate journal, now the *Hardware Age*. In those years Mr. Cope was a familiar figure at metal trades conventions in the middle West and became widely known in the iron and steel, hardware, stove, machine shop and foundry trades. No other editor connected with the David Williams Co. had to do with so many sides of its editorial work. He was willing to pay the full price of mastery of every detail of his diversified labors. He was indefatigable in application and unusual in the impartiality with which he liked every part of his work.

The same qualities that made him so valuable in the office of the American Iron and Steel Association were apparent in all of his editorial career. His accuracy, his painstaking with detail and his devotion to the truth were outstanding traits. He was impartial in his investigation and analysis of iron market conditions and always showed his high sense of the responsibilities involved in such work. One of his duties at Philadelphia was to educate iron and steel manufacturers to the point of freely contributing their statistics of production. A certain secretiveness had to be broken down and Mr. Cope made many trips in those early years in his mission of persuading manufacturers of the old school to cooperate for the common interest. Being a friendly man, he made friends for the association. Likewise, when he went to Chicago, that the western iron industry might receive its due in the columns of THE IRON AGE and that he might help in its upbuilding, his personality was a large factor in the prestige acquired by this publication in the Chicago and farther western districts.

Mr. Cope was called to the New York office in 1902. Through most of the following 15 years he was managing editor. From 1910 (on the retirement of Charles Kirchhoff as editor) to 1917, Mr. Cope and A. I. Findley shared the editorial direction of the paper. In addition to important editorial writing and the supervision of the market departments, Mr. Cope had charge of the copy desk. One could not overstate the contribution of his alertness, his precision and his scholarship to the tens of thousands of manuscript pages that passed through his hands.

On his retirement in April, 1917, Mr. Cope's associates gave him a dinner at the Engineers' Club, New York, and the souvenir of that occasion tells us it was "to signalize more than a generation of distinguished service in iron trade journalism — years of never flagging industry and of unswerving devotion to lofty ideals." Much was said on that occasion of the great contribution the guest of honor had made to that good will which appraisals of THE IRON AGE and its work have always rated so high.

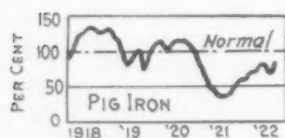
Mr. Cope leaves his wife and one son, Earl. The funeral services were held at the home, 5729 Florence Avenue, Philadelphia, on Monday, Dec. 7, and the burial was at Mount Moriah cemetery, in that city. The committal ritual was that of the Masonic fraternity, of which Mr. Cope had been long a member.



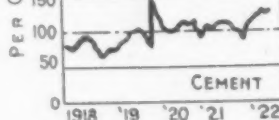
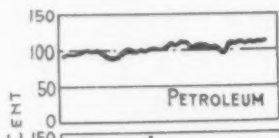
NO RHYTHM TO CYCLES

Business Movements Cannot Be Timed Regularly, According to Economist

Speaking before the Eastern Industrial Advertisers Association in Philadelphia, Dec. 4, Dr. Frank Parker, professor of finance at the University of Pennsylvania, said that cyclical movements in business were not regular and could not be timed according to any set formula. Attempts to prove rhythmic coincidence between various factors in the business equation, he said, were futile, since any frank examination of the facts showed that no such periodic regularity took place. He presented a number of charts, three of which are reproduced below, showing that when one business is far above normal and improving, another equally important industry may be below normal and declining.



Production in Basic Industries Expressed as Percentages of Normal Production. In Computing, Normal Allowance Has Been Made for Seasonal Variation and Year to Year Growth.



He advocated the method of exerting advertising and sales pressure at the time when business is least active, used by the Dennison Mfg. Co., South Framingham, Mass. This concern budgets a specific amount of money for advertising each year, lays it aside in actual cash and uses only enough to keep its business up to normal. If times are good, little is spent, but when times are bad, the reserve piled up from previous savings is thrown into the sales and advertising activities.

Dr. Parker recommended the search for specific economic factors which bear definite relations to the business in question. Where the general business cycle may not have a direct relation to the individual company, it does, of course, affect it indirectly.

William A. Staving, manager trade record division, Hercules Powder Co., Wilmington, Del., discussed the application of sales statistics to advertising and sales appropriations and urged a closer tie-up between such data and company budgets.

N. S. Greensfelder, vice-president Hercules Powder Co., was elected president of the association; D. J. Benoliel, International Chemical Co., Philadelphia, vice-president; J. D. Capron, United States Cast Iron Pipe & Foundry Co., Burlington, N. J., treasurer, and A. B. Harvey, J. E. Rhoads & Sons, Philadelphia, secretary.

PIG IRON CENSUS

Philadelphia Territory Found to Consume 1,200,000 Tons Annually for Foundries

PHILADELPHIA, Dec. 8.—The Philadelphia Foundrymen's Association meeting tonight at the Manufacturers' Club heard the result of a questionnaire which was recently sent out to ascertain the amount of pig iron annually consumed within a radius of 100 miles of Philadelphia. Walter Wood, of R. D. Wood & Co., cast iron pipe manufacturers, chairman of the pig iron census committee, reported that questionnaires had been mailed to 521 foundries, of which 250 had replied.

These 250 reported an aggregate annual pig iron consumption of 684,000 tons. Adding to this the melt of the Burlington, N. J., foundry of the United States Cast Iron Pipe & Foundry Co., Mr. Wood said, would bring the total to 800,000 tons. Fifty per cent could be added to this, in Mr. Wood's opinion, to account for the foundries not reporting, thus bringing the total to 1,200,000 tons of foundry iron used yearly in the im-

mediate Philadelphia territory. Mr. Wood estimated that steel plants in eastern Pennsylvania take 300,000 to 400,000 tons additional each year.

These figures were gathered by the Philadelphia Foundrymen's Association in an effort to show the advantages that blast furnaces located on the Delaware River in conjunction with a by-product coke plant would have in distributing iron to the Philadelphia foundry trade. The matter is pertinent just now because of negotiations pending between the city of Philadelphia and the United Gas Improvement Co. for a renewal of the gas lease covering Philadelphia's gas supply. Although no definite action has been taken by the city, the possibility of the city's constructing its own by-product coke and gas plant is being discussed.

C. F. A. Railroads to Ask Reopening of Jones & Laughlin Case

Carriers in Central Freight Association territory, who were named in the original complaint in the Jones & Laughlin freight rate case, plan to petition at an early date for a reopening. This action will follow closely the petition for a reopening of the case filed Nov. 24 by the Jones & Laughlin Steel Corporation.

Illinois Steel Co. Intervenes in Jones & Laughlin Case

WASHINGTON, Dec. 8.—Although it has no objection to the establishment of a reasonable basis of rates on iron and steel articles from the Pittsburgh district, the Illinois Steel Co., Chicago, nevertheless opposed the reopening of the Jones & Laughlin case, if it means that the Interstate Commerce Commission is to reconsider an increase in rates from plants in the Chicago district. The position of the Chicago company was made clear in an answer to the petition of the Jones & Laughlin Steel Corporation, filed by Charles S. Belsterling, attorney for the Illinois Steel Co. He requests that if the case be reopened, the question of the level of rates from the mills in the Chicago district be eliminated and that the issue upon rehearing be limited solely to the question as to what would be a reasonable basis of rates.

Southern Roads Oppose Mileage Scale for Steel Rates from Knoxville

WASHINGTON, Dec. 8.—Exceptions have been filed by Southern railroads to the recent report of W. M. Cheseldine, examiner of the Interstate Commerce Commission, which recommended application of the Jones & Laughlin mileage scale on iron and steel rates from Knoxville, Tenn., to points in Kentucky, Tennessee, Ohio and Mississippi River crossings and Central Freight Association territory. The existing rates from Knoxville had been attacked by the Knoxville Iron Co. The exceptions, filed by the Louisville & Nashville Railroad, declare that the proposed findings are unjust and unreasonable, and objection is made to the proposed application of the Jones & Laughlin scale.

"As indicating how drastic a reduction would result under the proposed report," says the petition, "reference is made to the fact that this basis for a haul of 278 miles is 9c. lower than from Birmingham, Ala., to Hopkinsville, Ky., 289 miles, which latter rate is held down by the competitive rates to Ohio River crossings."

The rate adjustment on iron and steel articles from Southern points to points in the North, says the railroad, revolves around the adjustment to Ohio River crossings, "the rates to which are made very low in order to enable Southern manufacturers to meet competition of Northern producers at such points."

"It seems perfectly obvious," the statement continues, "that if the proposed mileage scale is adopted from Knoxville, the producers at Chattanooga and Birmingham and other Southern producing points, will immediately demand the same basis from such points."

Asks Suspension of Proposed Pig Iron Rates from Southern Ohio

WASHINGTON, Dec. 8.—In a petition filed yesterday, the Louisville & Nashville Railroad requests the Interstate Commerce Commission to suspend tariffs of the Chesapeake & Ohio and Norfolk & Western railroads, effective Dec. 15, which reduce by 73c. per gross ton rates on pig iron from Ironton, Hanging Rock and Portsmouth, Ohio, to Louisville, Ky., Jeffersonville, New Albany, North Vernon, Ind., and from Ashland, Ky., to Louisville. The proposed cut is from \$3.38 to \$2.65 per ton. Addison R. Smith, vice-president in charge of traffic for the protesting carrier, said in the petition that the proposed rate was designed to meet the rate available on traffic by water, but that it did not bear a proper relation to the water rate. He contended that the rate is substantially lower than would be required for the railroad to compete with water transportation.

The petition declared that the proposed reduction would give southern Ohio blast furnaces a distinct advantage over other producers, especially Southern makers of pig iron. The cut in rate, he said, would be unreasonable and preferential of the southern Ohio furnace interests.

It was also stated that the proposed reduction would defeat one of the purposes of the recent revisions of rates on pig iron from Southern producing

points to the Ohio River cities, reference being made to the recent decision of the commission lowering rates from Birmingham and other Southern points to Ohio River crossings, St. Louis and intermediate points.

"The reason assigned by the initial carriers for the proposed reduced rate of \$2.65," said Mr. Smith, "is the competition afforded by water-borne pig iron from the so-called southern Ohio district to Louisville, but we submit such a rate is substantially lower than is necessary to enable the rail carriers to compete upon reasonable terms with the water route. It is our information that the all-water charge on pig iron from Ashland, Ky., to Louisville is \$2.48 per gross ton, including cost of delivery to the river front at origin and weighing, transfer, etc., at destination. The proposed rate of \$2.65 per gross ton, therefore, is only 17c. per gross ton higher than the all-water rate, which does not, we submit, represent a reasonable or proper differential and, in fact, virtually results in the rail lines meeting the all-water rate. Briefly stated, the water rates between the ports served by the Mississippi-Warrior service are 80 per cent of the contemporaneous rail rates and the resultant all-water rates include deliveries at origin and destination. Thus, measured by the differential basis observed by the Mississippi-Warrior service, the rail rate from the Ashland district to Louisville should not be less than \$3.10 per gross ton. In other words, the all-water rate of \$2.48 is 80 per cent of \$3.10."

Buyers Visit Hamilton Machine Tool Plant

With railroad and industrial buyers from all parts of the East and Middle West in attendance, the exhibit of tools of the Niles-Bement-Pond Co., which was held at its Hamilton, Ohio, plant Dec. 1, proved to be an unqualified success. The visitors were taken into the shop where they observed seven machines in operation. No attempt was made to convert the plant into an exhibition hall, but instead the guests were enabled to study the tools under normal working conditions.

Chief in interest among the machines was the new double-housing Timesaver planer, which is the most recent addition to the company's line. The ease of operation, increased rigidity and safe operation of this planer, together with the many other features, were demonstrated by a 42-in. model.

Another tool which attracted more than ordinary attention was a 30-in. Timesaver lathe. Its convenience of control and operation, whereby machining time is reduced and the operator's labor is lightened, were pointed out.

Other machines exhibited were a No. 4 carwheel lathe, a 90-in. locomotive axle

journal turning lathe, a 48-in., 400-ton hydraulic wheel press with pneumatic attachment for rapid traverse of ram, a 42-in. combination journal turning and axle lathe, and a 48-in. carwheel borer.

The exhibition was followed by a two-day sales conference of the company's district managers.



Prior to a Conference of Its District Managers, the Niles-Bement-Pond Co., at Its Hamilton, Ohio, Plant Introduced Several Machine Tools to Buyers Under Operating Conditions

French Competition Still a Factor

Depreciated Franc Favors French Business but Mills Are
Filling Up—American Loans to Germany
Aid Offers of Export Credits

(By Cablegram)

LONDON, ENGLAND, Dec. 7.

CLEVELAND pig iron makers have advanced foundry and forge iron prices 6d. for domestic sales and a shilling for export because of dearer fuel and have agreed to adopt a minimum price schedule. The effect on demand is uncertain but works are rather well booked. Hematite is firm with supplies still short and demand insistent. Foreign ore is firm with better demand and Bilbao Rubio quoted at 20s. 6d. to 21s. c.l.f. Tees.

Finished iron and steel markets are more cheerful on signs of better business but there is no general improvement as yet.

Export quotations on ship plates, angles, tees, channels, joists and bars have been reduced further by 2s. 6d. Bolckow, Vaughan & Co., Ltd., have booked 23,000 tons of rails for Egypt. Steel makers are hoping that the market has finally turned the corner.

The Continental market is dull but prices are fairly steady with Belgian, Luxemburg and French works well booked, but Germany short of business.

Franco-German trade negotiations are being resumed this week in Paris.

No definite progress was made in the recent negotiations for the formation of a European pipe makers syndicate. The Luxemburg companies Arbed and Terres Rouges are combining in order to regulate their production.

The Polish Upper Silesian industry is in a critical position but the government has promised large railroad contracts. The Colombian Government is reported to have placed an order for 4000 tons of rails in Belgium.

The British tin plate market is steady, although new inquiry is rather limited. Mills, however, are operating in the neighborhood of 90 per cent of capacity, and some options are being taken on a basis of

19s. 6d. There is a moderate, well-distributed demand for galvanized sheets and most works are booked to February. Prices are well maintained on galvanized, and although black sheets are quiet makers are firm.

British Domestic Pig Iron Demand Good—Tin Plate Pool Effective January 1

LONDON, ENGLAND, Nov. 26.—The general tone of the iron and steel markets has undoubtedly been better recently. Fairly steady selling of Cleveland pig iron to domestic consumers has been going on, and an encouraging feature has been the improvement in export business with the Continent. While no important business has recently been reported with the United States, sales were made a week or two ago, and there is expectation of repeat orders.

There has been some expansion in the volume of inquiry from overseas markets for finished products, but the actual amount of business placed is somewhat restricted, doubtless because of the fact that France is at present in the best position to book business in the international markets by reason of a depreciated exchange. Domestic demand, particularly from shipbuilding quarters, is still poor. The shipbuilding situation on the Clyde is stated to be better in merchant building, but of course the yards feel acutely the stringency in Admiralty orders. The Scottish Steel Makers Association has reduced the price of boiler plates by 10s., making the minimum price for local delivery £11 per ton. Apart from that it is reported elsewhere that relatively low prices have been made on plates and angles. Altogether, sentiment is good in the iron and steel markets, although there is but little tangible improvement so far. In galvanized sheets makers are fairly well booked, but at present new inquiry is

British and Continental European prices per gross ton, except where otherwise stated, f.o.b. makers' works, with American equivalent figured at \$4.85 per £, as follows:

Durham coke, del'd..	£1 1s.		\$5.09
Bilbao Rubio ore†...	1 0½		4.97
Cleveland No. 1 fdy.	3 8	and £3 9½s.	16.73 and \$16.74*
Cleveland No. 3 fdy.	3 6		16.00
Cleveland No. 4 fdy.	3 5½	and 3 6*	15.88 and 16.00*
Cleveland No. 4 forge	3 5	and 3 5½*	15.76 and 15.88*
Cleveland basic	3 5		15.76
East Coast mixed....	3 15		18.19
East Coast hematite.	4 19		24.00
Ferromanganese	15 10		75.18
*Ferromanganese	15 5		73.96
Rails, 60 lb. and up..	8 0	to 8 15	38.80 to 42.44
Billets	6 0	to 7 10	29.10 to 36.37
Sheets and tin plate			
bars, Welsh	6 5	to 6 10	30.31 to 31.52
Tin plates, base box..	0 19%	to 1 0%	4.79 to 4.91
			C. per Lb.
Ship plates	7 5	to 7 15	1.57 to 1.67
Boiler plates	11 0	to 11 10	2.56 to 2.67
Tees	7 7½	to 7 17½	1.59 to 1.69
Channels	6 12½	to 7 2½	1.43 to 1.54
Beams	6 7½	to 6 17½	1.38 to 1.48
Round bars ¾ to 3 in.	7 17½	to 8 7½	1.67 to 1.81
Steel hoops	10 15	and 12 10*	2.33 and 2.71*
Black sheets, 24 gage	11 5	to 11 10	2.44 to 2.67
Black sheets, Japanese			
specifications	15 5		3.30
Galv. sheets, 24 gage.	16 10	to 16 15	3.57 to 3.61
Cold rolled steel strip,			
20 gage	18 0		3.90

*Export price.

†Ex-ship, Tees, nominal.

Continental Prices, All F.O.B. Channel Ports

Foundry pig iron:(a)			
Belgium	£2 18s.		\$14.06
France	2 18		14.06
Luxemburg	2 18		14.06
Basic pig iron:(a)			
Belgium	2 17		13.82
France	2 17		13.82
Luxemburg	2 17		13.82
Coke	0 18		4.37
Billets:			
Belgium	4 6½	to £4 7½s.	20.97 to \$21.22
France	4 6½	to 4 7½	20.97 to 21.22
Merchant bars:			C. per Lb.
Belgium	5 5	to 5 6	1.13 to 1.14
Luxemburg	5 5	to 5 6	1.13 to 1.14
France	5 5	to 5 6	1.13 to 1.14
Joists (beams):			
Belgium	4 18	to 4 19	1.06 to 1.07
Luxemburg	4 18	to 4 19	1.06 to 1.07
France	4 18	to 4 19	1.06 to 1.07
Angles:			
Belgium	4 18	to 4 19	1.06 to 1.07
¾-in. plates:			
Belgium	6 4	to 6 6	1.34 to 1.36
Germany	6 4	to 6 6	1.34 to 1.36
½-in. ship plates:			
Belgium	5 15	to 5 17½	1.25 to 1.28
Luxemburg	5 15	to 5 17½	1.25 to 1.28
Sheets, heavy:			
Belgium	6 14	to 6 15	1.35 to 1.36
Germany	6 14	to 6 15	1.35 to 1.36

(a) Nominal.

scarce. An interesting development in the tin plate market is that the proposed plan of pooling output has been approved and will become operative the first of the year.

The financial statement of Bolckow, Vaughan & Co., for the year ending June 30, was issued a few days ago and showed a loss of £37,886 after debiting standing charges on idle plant.

GERMAN BUSINESS QUIET

French Competition Felt—Mergers Continue— American Loans Facilitate Export Credits

BERLIN, GERMANY, Nov. 24.—Negotiations for the creation of the Western Steel Trust have not yet been concluded and the resulting disappointment has caused some depression in the iron, steel and coal markets. The participation quotas of the merging companies have been agreed upon and the question now under consideration is whether the expected economy in operation will offset the heavy taxation cost of a merger. While it is probable that the advantages would ultimately outweigh the cost, doubt exists whether it is advisable in the present stringency of the money market to commit the companies to such expenditure. In other branches of the industry the movement to combine is progressing. At a recent convention of the electrotechnical industries, ex-Minister of Industry von Raumer and Herr Deutsch, director of the General Electricity Co., recommended a great horizontal trust. The creation of a great ship building combination has again been suggested in the present depression of the ship building industry. In 24 yards construction under way on Nov. 15 totaled only 133,167 gross tons, compared with 185,845 tons at the end of 1924, and 691,910 tons at the end of 1913. A Shipbuilders' convention which met last week advised against a merger, declaring that the only remedies were internal reform by the individual yards, and the elimination of the less profitable. An obstacle to such a combination, it is pointed out, is the fact that modern, low cost yards such as the Deutsche Werft of Hamburg have nothing in common with the less modern yards.

Negotiations for an international tube syndicate will shortly be resumed by German, French, Belgian and Czechoslovakian interests. The Borsig Co. and the Witten Cast Steel Co. have joined the Bar Iron Syndicate. The Deutsch-Luxemburg and Linke-Hofmann-Lauchhammer companies have joined the Thick Sheet Syndicate which now embraces all German producers of heavy sheets. The negotiations for an international Steel Cartel or agreement are progressing slowly, following the interruption in July when a general Franco-German commercial treaty was expected. It is predicted now that the international negotiators will come to a temporary agreement to come into force when the Franco-German treaty is concluded.

Industry in general shows signs of depression, but the cause is principally financial, for, despite numerous foreign loans, capital and credit are short and commercial settlements are slow. As a result the number of bankruptcies has greatly increased, being more than 1100 in October compared with an average of about 750 in the middle of this year. The number of publicly supported unemployed has increased to 364,000 comparable to the year's minimum in July of 1915,000. In part, this increase is seasonal, the result of winter slackness in the building trades.

In iron and steel the scrap market shows increased activity with a heavy demand for blast furnace scrap and turnings. The pig iron market is still depressed. Blast furnace operations at the end of October were 93 out of a total of 211 furnaces. Of the number blown out 64 were under repair.

Conditions in the domestic ore market have become worse. Practically no Siegerland ore is being bought, and more and more mines are closing. The Siegerland, Lahn, and Dill ore interests are pressing for special tax exemptions, and for re-establishment of the pre-war railroad rates on ore. Prices for ore have been slightly

weaker. A large stock of unsold Spanish ore has accumulated in the province of Viscaya. The German-Spanish trade war, which has been terminated by a provisional agreement, for a time seriously threatened business. Minette ore prices have been stationary, while northern French ore prices have moved downward.

The Pig Iron Syndicate has agreed to grant manufacturing consumers a price rebate of 6 marks per metric ton on all pig iron purchased for production of export products, following the system established by the steel syndicate for its products. Austrian producers have also adopted the system, obtaining as a result the consent of manufacturers to an increase in the bar iron duty from 2½ to 5 gold crowns per 100 kg.

The market for semi-finished materials has improved slightly. French competition as a result of the depreciated franc is particularly keen in this market, the tariff of 15 marks per ton being insufficient to keep French material out. In order to compete the Semi-Finished Steel Syndicate has been forced to sell far under production cost. French conditions of payment are also more favorable to purchasers than German offers. German buyers experience great difficulty in paying promptly. The latest decline of the franc has still further strengthened French competition. It is estimated that the export of pig iron and semi-finished material in 1925 will total close to 2,300,000 tons. French exports of rails during the first ten months of this year were 189,500 tons.

The German railroad materials market is in a fairly satisfactory position. Numerous small foreign orders have been received, including one from Japan. The demand for light rails is small. The domestic market for structural material is quiet, but there have been numerous foreign orders, although at unsatisfactory prices. No change has occurred in the bar market. Domestic demand for wire is small. In sheets the export market is better than the domestic but business is done at low prices. The Railroad Administration is rebuilding many bridges as a result of its adoption of 50-ton freight cars, but at present manufacturers of bridge material are not fully booked.

More Pig Iron in First Ten Months

Production of pig iron in October totaled 741,741 metric tons as compared with 759,193 tons in October, 1924; production in the first ten months of 1925, 8,700,335 tons compares with 6,153,241 tons in the same period of 1924. Production of steel in October was 928,339 tons, a decline from the 939,701 tons in October, 1924, but production in the ten months was 10,570,645 tons compared with only 7,817,533 tons in 1924. A small part of the production shown by these figures has been estimated.

Current quotations on finished and semi-finished Bessemer steel are as follows per metric ton f.o.b. works:

	Marks	
Blooms	111.75	\$26.60
Billets	119.25	28.38
Slabs	124.25	29.57
Structural shapes	131.25	31.24
Bars	134.30	31.96
Bands	154.20	36.70
Wire rods	140.00	33.32
Sheets, 1 mm. and less	175.00	41.65

As a result of the provision by leading German banks of 100,000,000 marks for an export credit to Russia, Russian orders for machinery and metal goods have increased orders for 72,000,000 marks, or nearly three-quarters of the credit, having been placed thus far. The federal government is considering following the British example and guaranteeing export credits. The recent American loans to German business have enabled German manufacturers to export on credit much more than was formerly the case with the result that a considerable East-European trade is being obtained. In fact, Germany acts merely as intermediary, borrowing in New York and transferring part of the money to Russia and to those other countries which buy largely on credit. In such cases while Germany risks loss through repudiation there is the advantage of eliminating American and British competition.

Iron and Steel Markets

New Record by Half Million Tons

Steel Output This Year May Exceed 44 Millions—Operations
Still Increasing, Though New Buying Is Less—
Large Rail Orders at Chicago

THE strong pace of late November has been maintained through the first week of December in the operation of steel mills, but with so many buyers covered for most of the first quarter, and some for all of it, the rate of new buying is naturally somewhat less.

With inventory only three weeks distant, shipments are a fair index of a consumption which producers regard as highly satisfactory. Buyers' stocks are likely to be added to early in January. That would mean further increase in output, but already there is a cautionary note lest the overproduction of last January be repeated.

The large steel ingot production of November—a daily rate of 156,000 tons against 144,000 tons in October—points to a surprising margin this year over the record of 43,619,000 tons in 1917. If December output equals that of November, the 1925 total will be 44,100,000 tons, or a half million tons above the high war-time mark. Steel making last month was at a yearly rate of about 48,500,000 tons, against more than 50,000,000 tons a year for the record month of March, 1924.

The Steel Corporation is now operating on an 87 per cent basis and that is the average reported for all the large producers in the Pittsburgh and nearby districts. With two blast furnaces started up since Dec. 1 by the Carnegie Steel Co. and one by Bethlehem, the tendency is still upward. A merchant furnace in the Lehigh Valley and one in eastern New York are about to blow in.

The Nov. 30 unfilled tonnage statement is swelled by the formal entering of a large volume of rail contracts in the Chicago district, so that in spite of the heavy shipments of last month the gain to be shown on Dec. 10 may be pronounced. The Burlington's order, just placed, is for 25,000 tons. The Nickel Plate is inquiring for 20,000 tons. Orders for track fastenings are still on a large scale.

Orders for 2200 freight cars and inquiries for 2600, orders for 53 locomotives and inquiries for 59, and reports of large prospective car purchases for the Van Sweringen roads are features in the railroad equipment market.

With awards of nearly 33,000 tons of fabricated steel work and fresh inquiries for 34,000 tons, the December rate of bookings for the larger size projects is fully up to the weekly average of the first four months of the year, though somewhat down from the 39,000-ton average for October and November.

The higher prices sheet mills have been asking apply to first quarter business, but concessions of \$2 a ton have been made both in the East and the Central West for immediate specifications.

Some sheet mills are paying premiums in piecing out their sheet bar supply for this month and

the amount offered for first quarter delivery is not over plentiful. An inquiry has come up in Ohio for 30,000 tons of sheet bars and small billets.

Plate mills in the East are putting 1.80c. business on their books for the first quarter, but 1.70c., and in fewer cases 1.60c., has been done for shipment this month.

Business in light rails is not holding up to that of October and November and makers are finding it difficult to advance prices.

Specifications for cold-finished steel bars are now running ahead of shipments with most makers, though usually inventories prove a check in December. Current orders represent purchases prior to the fixing of higher extras.

Detroit automobile companies have bought round lots of bars, sheets and strip steel in the past week, covering the first quarter. They are trying to buy forgings, springs and other parts at the fourth quarter level, but parts makers are asking more, in view of the advances in steel.

The buying of 45,000 tons of basic iron for an eastern Pennsylvania plate mill is the event of the week in pig iron. Foundries are well supplied with iron, particularly in the East. Central Western consumption is on a larger scale, Ohio foundries reporting October output of castings the largest in several years.

All markets report weakness in steel scrap, with the prospect that demand will lag through December. The Pittsburgh price is about 50c. lower.

Blast furnace coke for the first quarter has been offered at \$4.25 and slightly lower, with the letting down in the demand for coke to replace hard coal.

Pittsburgh

Steel Market Strong but Neither Prices Nor Production Are Being Pressed

PITTSBURGH, Dec. 8.—The interesting feature of the steel market is the lack of excitement over a very good business. The situation also is notable for an absence of any tendency on the part of manufacturers to be stampeded into unduly speeding up production or diverted from a determination to let prices find their basis in a natural way. It will be recalled that a year ago, with order books not very much larger than at present, there was a rapid increase in production, with some companies setting new high records, and prices were marked up. This course later proved disastrous and there is now no disposition to repeat it.

The fact that this is the last month of the year and inventories are close at hand, seems to be having little influence on demand for steel as reflected in specifications, and in the meantime contracts for first quarter

A Comparison of Prices

Advances Over the Previous Week in Heavy Type, Declines in Italics
At Date, One Week, One Month, and One Year Previous
For Early Delivery

Pig Iron, Per Gross Ton:	Dec. 8, 1925	Dec. 1, 1925	Nov. 10, 1925	Dec. 9, 1924
No. 2X, Philadelphia...	\$24.26	\$24.26	\$23.76	\$24.51
No. 2, Valley furnace...	20.50	20.50	20.50	20.50
No. 2, Southern, Cin'ti...	25.69	24.69	25.05	24.05
No. 2, Birmingham, Ala...	22.00	22.00	21.00	20.00
No. 2 foundry, Ch'go furn...	23.00	23.00	23.00	22.00
Basic, del'd, eastern Pa...	23.00	23.00	22.50	23.00
Basic, Valley furnace...	20.00	20.00	20.00	20.50
Valley Bessemer del'd P'gh	22.76	22.76	22.76	23.26
Malleable, Chicago furn...	23.00	23.00	23.00	22.00
Malleable, Valley	20.50	20.50	20.50	20.50
Gray forge, Pittsburgh...	21.76	21.76	21.76	21.76
L. S. charcoal, Chicago...	29.04	29.04	29.04	29.04
Ferromanganese, furnace...	115.00	115.00	115.00	105.00

Rails, Billets, etc., Per Gross Ton:

	Dec. 8, 1925	Dec. 1, 1925	Nov. 10, 1925	Dec. 9, 1924
O.-h. rails, heavy, at mill...	\$43.00	\$43.00	\$43.00	\$43.00
Bess. billets, Pittsburgh...	35.00	35.00	34.00	35.50
O.-h. billets, Pittsburgh...	35.00	35.00	34.00	35.50
O.-h. sheet bars, P'gh...	36.00	36.00	35.00	37.00
Forging billets, base, P'gh	40.00	40.00	40.00	42.50
O.-h. billets, Phila...	40.30	40.30	39.30	41.67
Wire rods, Pittsburgh...	45.00	45.00	45.00	48.00
Cents				
Skelp, gr. steel, P'gh, lb...	1.90	1.90	1.90	2.00
Light rails at mill...	1.65	1.65	1.65	1.80

Finished Iron and Steel,

Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Iron bars, Philadelphia...	2.22	2.22	2.12	2.22
Iron bars, Chicago...	2.00	2.00	1.90	2.00
Steel bars, Pittsburgh...	2.00	2.00	2.00	2.10
Steel bars, Chicago...	2.10	2.10	2.10	2.10
Steel bars, New York...	2.34	2.34	2.34	2.44
Tank plates, Pittsburgh...	1.90	1.90	1.85	1.90
Tank plates, Chicago...	2.10	2.10	2.10	2.20
Tank plates, New York...	2.04	1.94	1.94	2.24
Beams, Pittsburgh	1.90	1.90	1.90	2.10
Beams, Chicago	2.10	2.10	2.10	2.20
Beams, New York...	2.24	2.24	2.24	2.34
Steel hoops, Pittsburgh...	2.50	2.50	2.50	2.50

*The average switching charge for delivery to foundries in the Chicago district is 61c. per ton.

†Silicon, 1.75 to 2.25. ‡Silicon, 2.25 to 2.75.

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our market reports on other pages.

Sheets, Nails and Wire,	Dec. 8, 1925	Dec. 1, 1925	Nov. 10, 1925	Dec. 9, 1924
Per Lb. to Large Buyers:				
Sheets, black, No. 28, P'gh	3.35	3.25	3.25	3.50
Sheets, black, No. 28, Chi-				
cago dist. mill...	3.45	3.45	3.35	3.70
Sheets, galv., No. 28, P'gh	4.60	4.60	4.50	4.75
Sheets, galv., No. 28, Chi-				
cago dist. mill...	4.70	4.70	4.60	4.85
Sheets, blue, 9 & 10, P'gh	2.50	2.50	2.40	2.70
Sheets, blue, 9 & 10, Chi-				
cago dist. mill...	2.60	2.60	2.50	2.80
Wire nails, Pittsburgh...	2.65	2.65	2.65	2.85
Wire nails, Chicago dist.				
mill	2.70	2.70	2.70	2.95
Plain wire, Pittsburgh...	2.50	2.50	2.50	2.60
Plain wire, Chicago dist.				
mill	2.55	2.55	2.55	2.70
Barbed wire, galv., P'gh...	3.35	3.35	3.35	3.55
Barbed wire, galv., Chi-				
cago dist. mill...	3.40	3.40	3.40	3.65
Tin plate, 100 lb. box, P'gh	\$5.50	\$5.50	\$5.50	\$5.50

Old Material, Per Gross Ton:

Carwheels, Chicago	\$18.50	\$18.50	\$18.25	\$19.50
Carwheels, Philadelphia	18.50	18.50	18.50	19.00
Heavy steel scrap, P'gh...	19.00	19.50	19.50	21.50
Heavy steel scrap, Phila...	17.50	17.50	17.50	19.50
Heavy steel scrap, Ch'go...	15.75	15.75	16.00	18.25
No. 1 cast, Pittsburgh...	18.00	18.00	18.00	19.00
No. 1 cast, Philadelphia...	18.00	18.00	18.00	19.00
No. 1 cast, Ch'go (net ton)	17.25	18.00	18.25	18.50
No. 1 RR. wrot, Phila...	18.50	18.50	18.50	20.00
No. 1 RR. wrot, Ch'go (net)	14.00	15.00	15.75	16.50

Coke, Connellsville,

Per Net Ton at Oven:

Furnace coke, prompt...	\$3.50	\$3.85	\$6.00	\$3.50
Foundry coke, prompt...	4.75	5.25	7.00	4.50

Metals,

Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Lake copper, New York...	14.25	14.37½	14.87½	14.25
Electrolytic copper, refinery	13.87½	14.00	14.55	13.87½
Zinc, St. Louis...	8.75	8.70	8.75	7.07½
Zinc, New York...	9.00	9.05	9.10	7.42½
Lead, St. Louis...	9.00	9.25	9.50	8.70
Lead, New York...	9.25	9.50	9.90	9.00
Tin (Straits), New York...	63.50	63.75	62.37½	55.12½
Antimony (Asiatic), N. Y.	20.25	20.00	20.00	14.40

THE IRON AGE Composite Prices

Finished Steel

Dec. 8, 1925, 2.453c. Per Lb.

One week ago	2.439c.
One month ago	2.431c.
One year ago	2.531c.
10-year pre-war average	1.689c.

Based on prices of steel bars, beams, tank plates, plain wire, open-hearth rails, black pipe and black sheets. These products constitute 88 per cent of the United States output of finished steel.

	High		Low
1925	2.560c., Jan. 6	2.396c., Aug. 18	
1924	2.789c., Jan. 15	2.460c., Oct. 14	
1923	2.824c., April 24	2.446c., Jan. 2	

Pig Iron

Dec. 8, 1925, \$21.54 Per Gross Ton

One week ago	\$21.54
One month ago	21.29
One year ago	21.34
10-year pre-war average	15.72

Based on average of basic and foundry irons, the basic being Valley quotation, the foundry an average of Chicago, Philadelphia and Birmingham.

	High		Low
1925	\$22.50, Jan. 13	\$18.96, July 7	
1924	22.88, Feb. 26	19.21, Nov. 3	
1923	30.86, March 20	20.77, Nov. 20	

tonnages are coming along in a very satisfactory way. The business is well distributed among the various products, pipe alone being a laggard. Activity in that line, however, is not usual at this time of the year.

The recent rate of ingot production is fully maintained, the general average of this and nearby districts still being about 87 per cent of capacity. The Carnegie Steel Co. has added two blast furnaces to the active list since a week ago, one Isabella in Pittsburgh and one of its New Castle, Pa., group. This gives that company 39 furnaces in blast out of a total of 53, which is now its total number of furnaces, in view of the fact that it recently began the dismantling of a stack at Steubenville, Ohio, which had been idle for several years. There is no occasion to change prices, but the market has a very firm tone, and with the

manufacturers comfortably supplied with business, it naturally takes more attractive orders to bring out minimum quotations than was the case recently.

The pig iron market continues inactive, but there is no pressure to sell, and recent prices are holding very firmly. The advance in prices from the low point of the year was brought about chiefly by pig iron demand, rather than by the advance in coke, and now that coke has receded to within about 50c. a ton of the prices ruling just before the flurry created by the anthracite strike, the pig iron market is not disturbed.

Spot furnace coke has been selling lately as low as \$3.50 per net ton, at ovens, as compared with as high as \$9 when the Eastern demand was at its height, and some coke that could be used by blast furnaces in a pinch has sold as low as \$3.25. There have been

definite offers of first quarter tonnages of furnace coke at \$4.50 and even to \$4.25. Cold weather probably will bring with it a stronger market for coke unless there is an early settlement of the anthracite dispute, but producers realize the necessity of having a backlog in case of a sudden drop in domestic demand, and no longer have exalted ideas about prices for metallurgical coke.

Consumers remain indifferent toward the scrap market because so many important users are well covered against their immediate requirements, and there are no signs that prices will move much either way from present levels.

Pig Iron.—There is no longer much concern about being fortified against sharp advances in prices. It is evident, however, that the melt is fairly high because shipping instructions are coming along freely against old orders, and almost all producers are shipping more than they are making. Considerable iron originally ordered for first quarter shipment is being ordered out. There is very little unsold iron in the yard stocks of merchant producers, and they also are well committed against current production. In a few instances they have sold a considerable part of their production for the first quarter of next year. The fact that there is no pressure to sell at present is hardly surprising in view of these circumstances, and there is the added factor that if a fair profit is to be secured present prices must hold. Nothing yet has developed in connection with 1926 ore business, but there is some talk of higher prices. Local advices are that stocks at Upper Lake docks have been cleaned up, and also that it seems to be the plan of mining companies operating on a royalty basis to take out minimum tonnages in 1926. Since the common purpose of the industry, as a whole, is to make a fair profit in 1926, and ore prices were profitable to but few companies in the past year, there is additional reason for expecting stiffer ore prices next year. If the courts approve, the furnace of the Struthers Furnace Co., now in receivership, will be blown in around Jan. 1, under a lease by the receiver to W. C. Holdsworth, superintendent of the blast furnace of the Sharon Steel Hoop Co., Lowellville, Ohio. A supply of ore is available, and negotiations now are in progress for a supply of coke.

We quote Valley furnace, the freight rate for delivery to the Cleveland or Pittsburgh district being \$1.76 per gross ton:

Basic	\$20.00
Bessemer	21.00
Gray forge	20.00
No. 2 foundry	20.50
No. 3 foundry	20.00
Malleable	20.50
Low phosphorus, copper free	\$28.00 to 28.60

Ferroalloys.—A fair amount of interest is being shown in first quarter tonnages of ferromanganese, but most of the contracts that are being placed for that period are from smaller consumers and do not reach very large proportions. Not a few users are going on the theory that they will be protected by their regular sources of supply and that with neither a shortage nor higher prices immediately imminent, they can afford to be sparing buyers. The ruling price still is \$115, Atlantic seaboard, for either domestic or foreign ferromanganese. New features are lacking in high grade ferrosilicon and in spiegeleisen. Ferrotungsten is not easy to sell at more than \$1.15 per lb. Prices are given on page 1627.

Semi-Finished Steel.—Non-integrated sheet makers are showing some concern because they have not secured sufficient coverage against their requirements over the next 90 days, and many inquiries are out for additional supplies. Producers generally are well sold and some are not anxious for additional business at today's prices. In this and the Youngstown districts no sales are reported at higher than \$36, but that price at least has been firmly established by recent business. Much first quarter business in billets and slabs is reported to have been closed in the past week at \$35 for 4-in. x 4-in. and larger billets and the equivalent sizes in slabs. Some makers do not want more business at that price, but higher figures are yet to be obtained. There is a quotation of \$46, base, Pittsburgh,

on wire rods, but it does not mean much so far as sales are concerned, as most makers have named \$45, Pittsburgh or Cleveland, on first quarter business. The skelp market is inactive, with prices nominal. Prices are given on page 1627.

Wire Products.—The trend of demand still is toward betterment and while the market cannot be called active it is making a good showing for the time of year, with the inventory period close at hand and with buying lacking the stimulation of advancing prices. First quarter contracts in manufacturers' wire are being taken at \$2.50, base per 100 lb., Pittsburgh or Cleveland, which has been the price for several months, and jobbers are being protected for 60 days in wire and the products at today's prices. There seems to be little danger either of overselling or of a repetition of the frequent price advances of a year ago; heavy order books of a year ago proved in many cases to be nothing more than sales in excess of real requirements, taking buyers out of the market for such a long period that marked price weakness resulted from efforts of manufacturers to interest them. Now the effort is to build order books on a sounder foundation. There are some price deviations, but they are not frequent or large enough to undermine the general price structure. Prices are given on page 1625.

Rails and Track Accessories.—Mills in this district are fairly well supplied with spike and other track accessory business and demand is continuing, with prices holding well. Standard rail business for 1926 is largely closed and there is enough to keep the local unit going full for about five months. Light rail business is not holding up to that of October and November and while makers are striving for higher prices they find it hard to establish them with demands so light. Prices are given on page 1625.

Sheets.—The market now seems generally quotable on the basis of prices recently announced for first quarter contracts by manufacturers representing the greater part of the country's capacity, or 3.35c., base Pittsburgh, for black, 4.60c., base, for galvanized, and 2.50c., base, for blue annealed. There are few mills that can take any business for shipment before the end of the year and in competition for first quarter tonnage those prices have been obtained. There are some mills which are not adhering to 3.35c., base Pittsburgh, on black sheets, and occasional deviations are noted in blue annealed, but there is no question as to the firmness of the market on galvanized sheets, some makers of which are solidly committed for the next seven or eight weeks. Price deviations are by mills representing such a small part of the capacity that, in a general way, the prices mentioned above are representative. The American Sheet & Tin Plate Co. last week operated at more than 93 per cent of capacity and the general average of sheet mill engagement was close to that rate. Prices are given on page 1625.

Tin Plate.—Container manufacturers still are engaged in estimating their first half of 1926 requirements, but specifications for January shipment are coming in well. The leading can company has indicated its 1926 requirements, but information as to the amount is withheld. Tin plate makers are beginning a new year with much lighter stocks and much less carry-over business on their books than was the case a year ago. This is not surprising in view of the big packs of vegetables. A report recently compiled shows the pack of green corn to have been 24,000,000 cases of 24 cans; that is 5,000,000 cases in excess of early estimates and 10,000,000 cases above the average of recent years. The pea pack is placed at 19,000,000 cases, or well up to the 1924 record. Reports are not available yet on some of the other vegetables, but the expectation is that they will be large compared with the average for recent years.

Cold-Finished Steel Bars and Shafting.—Orders still are pouring in freely and with most makers are running ahead of shipments. Meanwhile first quarter contracts are being placed with considerable freedom, but it is a little early for specifications against them. It is a time of year when current demands usually are

Prices of Finished Iron and Steel Products (Carload Lots)

Iron and Steel Bars

Soft Steel

	Base Per Lb.
F.o.b. P'gh mills.....	2.00c. to 2.10c.
F.o.b. Chicago.....	2.10c. to 2.20c.
Del'd Philadelphia.....	2.32c. to 2.42c.
Del'd New York.....	2.34c. to 2.44c.
Del'd Cleveland.....	2.19c. to 2.29c.
F.o.b. Birmingham.....	2.15c. to 2.25c.
C.i.f. Pacific ports.....	2.35c. to 2.45c.
F.o.b. San Francisco mills.....	2.40c.

Billet Steel Reinforcing

F.o.b. Pittsburgh mills.....	2.00c. to 2.10c.
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Rail Steel

F.o.b. mill.....	1.80c. to 1.90c.
F.o.b. Chicago.....	2.00c. to 2.10c.

Iron

Common iron, f.o.b. Chicago.....	2.00c.
Refined iron, f.o.b. P'gh mills.....	3.00c.
Common iron, del'd Phila'phia.....	2.22c.
Common iron, del'd New York.....	2.24c.

Tank Plates

	Base Per Lb.
F.o.b. Pittsburgh mill.....	1.90c. to 2.00c.
F.o.b. Chicago.....	2.10c. to 2.20c.
F.o.b. Birmingham.....	2.05c. to 2.15c.
Del'd Cleveland.....	1.99c. to 2.09c.
Del'd Philadelphia.....	2.02c. to 2.12c.
Del'd New York.....	2.04c. to 2.14c.
C.i.f. Pacific ports.....	2.30c. to 2.35c.

Structural Shapes

	Base Per Lb.
F.o.b. Pittsburgh mill.....	1.90c. to 2.10c.
F.o.b. Chicago.....	2.10c. to 2.20c.
F.o.b. Birmingham.....	2.05c. to 2.15c.
Del'd Cleveland.....	2.09c. to 2.19c.
Del'd Philadelphia.....	2.22c. to 2.32c.
Del'd New York.....	2.24c. to 2.34c.
C.i.f. Pacific ports.....	2.35c. to 2.40c.

Hot-Rolled Flats (Hoops, Bands and Strips)

	Base Per Lb.
All gages, narrower than 6 in., P'gh.....	2.50c.
All gages, 6 in. and wider, P'gh.....	2.30c.
All gages, 6 in. and narrower, Chicago.....	2.60c.
All gages, wider than 6 in., Chicago.....	2.50c.

Cold-Finished Steel

	Base Per Lb.
Bars, f.o.b. P'gh mills.....	2.50c.
Bars, f.o.b. Chicago.....	2.50c.
Bars, Cleveland.....	2.55c.
Shafting, ground, f.o.b. mill.....	2.70c. to 3.00c.
Strips, f.o.b. P'gh mills.....	3.90c.
Strips, f.o.b. Cleveland mills.....	3.90c.
Strips, delivered Chicago.....	4.20c.
Strips, f.o.b. Worcester mills.....	4.05c.

*According to size.

Wire Products

(To jobbers in car lots f.o.b. Pittsburgh and Cleveland)

	Base Per Keg
Wire nails.....	\$2.65
Galv'd nails, 1-in. and longer.....	4.65
Galv'd nails, shorter than 1 in.....	4.90
Galv'd staples.....	3.35
Polished staples.....	3.10
Cement coated nails, base, per count keg.....	1.85

	Base Per 100 Lb.
Bright plain wire, No. 9 gage.....	\$2.50
Annealed fence wire.....	2.65
Spring wire.....	3.50
Galv'd wire, No. 9.....	3.10
Barbed wire, galv'd.....	3.35
Barbed wire, painted.....	3.10

Chicago district mill and delivered Chicago prices are \$1 per ton above the foregoing. Birmingham mill prices \$3 a ton higher; Worcester, Mass., mill \$3 a ton higher on production of that plant, and Duluth, Minn., mill \$2 a ton higher; Anderson, Ind., \$1 higher.

Woven Wire Fence

Base to Retailers Per Net Ton

F.o.b. Pittsburgh.....	\$65.00
F.o.b. Cleveland.....	65.00
F.o.b. Anderson, Ind.....	66.00
F.o.b. Chicago district mills.....	67.00
F.o.b. Duluth.....	68.00
F.o.b. Birmingham.....	68.00

Sheets

Blue Annealed

	Base Per Lb.
Nos. 9 and 10, f.o.b. Pittsburgh.....	2.50c.
Nos. 9 and 10, f.o.b. Ch'go dist. mills.....	2.60c.
Nos. 9 and 10, del'd Phila'phia.....	2.72c. to 2.82c.

Box Annealed, One Pass Cold Rolled

No. 28, f.o.b. Pittsburgh.....	3.35c.
No. 28, f.o.b. Ch'go dist. mill.....	3.45c.
No. 28, del'd Phila'phia.....	3.57c. to 3.67c.

Galvanized

No. 28, f.o.b. Pittsburgh.....	4.60c.
No. 28, f.o.b. Chicago dist. mill.....	4.70c.
No. 28, del'd Phila'phia.....	4.82c. to 4.92c.

Tin Mill Black Plate

No. 28, f.o.b. Pittsburgh.....	3.35c.
No. 28, f.o.b. Chicago dist. mill.....	3.45c.

Automobile Body Sheets

No. 22, f.o.b. Pittsburgh.....	4.50c.
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Long Ternes

No. 28, 8-lb. coating, f.o.b. mill.....	4.35c.
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Tin Plate

	Per Base Box
Standard cokes, f.o.b. P'gh district mills.....	\$5.50
Standard cokes, f.o.b. Gary and Elwood, Ind.....	5.60

Terne Plate

(F.o.b. Morgantown or Pittsburgh)
(Per package, 20 x 28 in.)

8-lb. coating, 100.....	20-lb. coating I.C. \$16.20
1b. base.....	\$11.40
8-lb. coating I.C. 11.70.....	25-lb. coating I.C. 17.90
15-lb. coating I.C. 14.85.....	30-lb. coating I.C. 19.45
	40-lb. coating I.C. 21.65

Alloy Steel Bars

(F.o.b. Pittsburgh or Chicago)

S. A. E. Series Numbers	Base Per 100 Lb.
2100* (½% Nickel, 0.10% to 0.20% Carbon).....	\$3.25 to \$3.30
2300 (¾% Nickel).....	4.60 to 4.70
2500 (5% Nickel).....	5.80 to 5.90
3100 (Nickel Chromium).....	5.60 to 5.70
3200 (Nickel Chromium).....	5.25 to 5.35
3300 (Nickel Chromium).....	7.25 to 7.35
3400 (Nickel Chromium).....	6.50 to 6.60
5100 (Chromium Steel).....	3.60
5200* (Chromium Steel).....	7.50 to 8.25
6100 (Chrom. Vanadium bars).....	4.50 to 4.40
6100 (Chrom. Vanad. spring steel).....	3.85
9250 (Silicon Manganese spring steel).....	3.25 to 3.30
Carbon Vanadium (0.45% to 0.55% Carbon, 0.15% Vanad.).....	4.20 to 4.45
Nickel Chrome Vanadium (0.60 Nickel, 0.50 Chrom., 0.15 Vanad.).....	4.55 to 4.65
Chromium Molybdenum bars (0.80—1.10 Chrom., 0.25—0.40 Molyb.).....	4.35 to 4.45
Chromium Molybdenum bars (0.50—0.70 Chrom., 0.15—0.25 Molyb.).....	3.50 to 3.60
Chromium Molybdenum spring steel (1—1.25 Chrom., 0.30—0.50 Molyb.).....	4.75 to 5.00

Above prices are for hot-rolled steel bars, forking quality. The ordinary differential for cold-drawn bars is 1c. per lb. higher. For billets 4 x 4 to 10 x 10 in. the price for a gross ton is the net price for bars of the same analysis. For billets under 4 x 4 in. down to and including 2½-in. squares, the price is \$5 a gross ton above the 4 x 4 billet price.

*Not S. A. E. specifications, but numbered by manufacturers to conform to S. A. E. system.

Rails

Per Gross Ton

Standard, f.o.b. mill.....	\$49.00
	Base Per Lb.
Light (from billets), f.o.b. mill.....	1.65c. to 1.70c.
Light (from billets), f.o.b. Ch'go mill.....	1.80c. to 1.90c.
Light (from rail steel), f.o.b. mill.....	1.50c. to 1.60c.

Track Equipment

(F.o.b. Mill)

	Base Per 100 Lb.
Spikes, ½ in. and larger.....	\$2.80 to \$3.10
Spikes, ½ in. and smaller.....	3.00 to 3.50
Spikes, boat and barge.....	3.25
Track bolts, all sizes.....	3.90 to 4.25
Tie plates, steel.....	2.25 to 2.50
Angle bars.....	2.75

Welded Pipe

Base Discounts f.o.b. Pittsburgh District and Lorain, Ohio, Mills

Butt Weld			
Inches	Steel	Black	Galv.
½.....	45	19½	24
¾.....	51	25½	30
1.....	56	31½	36
1 ½.....	60	36½	40
2.....	62	38½	42
Lap Weld			
2.....	55	43½	48
2 ½ to 6.....	59	47½	52
7 and 8.....	56	45½	50
9 and 10.....	54	43½	48
11 and 12.....	53	42½	47

Butt Weld, extra strong, plain ends

½.....	41	24½	29
¾.....	47	30½	35
1.....	53	36½	41
1 ½.....	58	42½	46
2.....	60	44½	48

Lap Weld, extra strong, plain ends

2.....	53	42½	47
2 ½ to 4.....	57	46½	51
4 ½ to 6.....	56	45½	50
7 to 8.....	52	41½	46
9 and 10.....	45	32½	37
11 and 12.....	44	31½	36

To the large jobbing trade the above discounts on steel pipe are increased (on black) by one point, with supplementary discount of 5% and (on galvanized) by 1½ point, with supplementary discount of 5%. On iron pipe, both black and galvanized, the preferentials to large jobbers are 1, 5 and 2½% beyond the above discount.

Note.—Chicago district mills have a base two points less than the above discounts. Chicago delivered base 2½ points less. Freight is figured from Pittsburgh, Lorain, Ohio, and Chicago district mills, the billing being from the point producing the lowest price to destination.

Boiler Tubes

Base Discounts f.o.b. Pittsburgh

Lap Welded Steel	Charcoal Iron
2 to 2½ in.....	27
2½ to 3 in.....	27
3 in.....	27
3½ to 4 in.....	27
4 to 4½ in.....	27

Beyond the above discounts, 5 to 7 five extra are given on lap welded steel tubes and 2 to 3 tens on charcoal iron tubes.

Standard Commercial Seamless Boiler Tubes

Cold Drawn	Hot Rolled
1 in.....	60
1½ to 1¾ in.....	52
1¾ in.....	36
2 to 2½ in.....	31
2½ to 3 in.....	39

2 and 2½ in.....	34
2½ and 3 in.....	42
3 in.....	48

Less carloads, 4 points less. Add \$8 per net ton for more than four gages heavier than standard. No extra for lengths up to and including 34 ft. Sizes smaller than 1 in. and lighter than standard gage to be held at mechanical tube list and discount. Intermediate sizes and gages not listed take price of next larger outside diameter and heavier gage.

Seamless Mechanical Tubing (New List)

	Per Cent off List
Carbon, 0.10% to 0.30%, base.....	50 to 55
Carbon, 0.30% to 0.40%, base.....	45 to 50
Plus differentials for lengths over 16 ft. and for commercially exact lengths. Warehouse discounts on small lots are less than the above.	

light because of the inventory consideration, but actual consumption is large and there is also the fact that material now moving does not carry the higher extras recently adopted.

Hot-Rolled Flats.—The market still is very firm on material narrower than 6 in., makers of which are well supplied with business, but the failure of the plate market to advance materially has made it difficult for makers of strips to take a strong stand at 2.30c., base, for wide stock. Prices are given on page 1625.

Cold-Rolled Strips.—Most makers report an excess of orders over shipments that seems to assure good operations for the early part 1926. The ruling price still is 3.90c., base, Pittsburgh or Cleveland. Some makers have tried, but without success, to get 4c.

Bolts, Nuts and Rivets.—First quarter contracts are beginning to be closed and there are fair specifications against those for the present quarter. Inasmuch as bolt and nut prices have been virtually stationary for practically a year, there is less incentive to buy on a contract basis. The price of rivets for first quarter is much higher than that on current shipments, and this is helping specifications on business placed for delivery in this quarter. Prices and discounts are given on page 1627.

Steel and Iron Bars.—The market is still quotable at 2c. to 2.10c., base Pittsburgh, on steel bars, but makers are not "hungry" for business and are picking orders carefully, getting the higher price on many tonnages of a size they would have been glad to sell at 2c. a short time ago. There is good specification against old orders, and first quarter business is coming in steadily without much pressure by makers. Iron bars are moving steadily at recent prices. Prices are given on page 1625.

Structural Steel.—Mills have very firm ideas on prices, and while the large tonnages continue to be sold at 1.90c., base Pittsburgh, an increasing number of orders are being taken at 2c. The mills are hopeful of establishing the latter price on large tonnages. Inquiry for fabricated steel is reported to be good, and local shops benefit by some recent fair-sized awards. Plain material prices are given on page 1625.

Plates.—Stiffening of the Eastern market on plates is, of course, favorable to local mills, since it makes it possible for them to go further afield without materially shading prices obtainable in the Pittsburgh area. The fact that mills in this district have a fair amount of plate business may have been responsible for the stronger market in the East, since it meant less competition there from Pittsburgh district mills. The market here is still quotable at 1.90c., to 2c., base Pittsburgh, with the aim of the mills to establish the latter figure as the minimum for early 1926. Prices are given on page 1625.

Tubular Goods.—The situation has not changed much, business being seasonably quiet and, with competition for orders a little sharper than it is when requirements are heavier, prices are slightly irregular. Standard pipe is moving relatively well, but lapweld pipe feels the pause in oil well drilling. Oil prices are strengthening and, with some refiners already drawing on storage stocks, it is believed that drilling activities will be stimulated and that demand for oil country pipe will improve appreciably after the turn of the year. There is still considerable competition for boiler tube business and prices continue to favor buyers. Discounts are given on page 1625.

Coke and Coal.—Spot coke prices continue to sink lower because there has been no curtailment of beehive oven production in keeping with the letdown in the demand for coke to replace hard coal and an escape from accumulations has been possible only by the acceptance of buyers' offers. Spot furnace coke lately has been selling at from \$3.50 to \$4, and coke slightly higher in sulphur has gone as low as \$3.25. The time is at hand for setting prices for first quarter contracts for furnace coke, and producers now are quoting from \$4.25 to \$4.50, as against \$5 recently. Spot foundry coke is quotable at from \$4.75 to \$5.50. There is a good market for slack coal, and some improvement in

the demand for the prepared sizes for domestic use, but coal for industrial purposes is still rather quiet. Prices are given on Page 1627.

Old Material.—The market is weaker and 50c. a ton lower on the steel works grades. Few of the steel manufacturers in this and nearby districts are interested in supplies at the moment and the fact that this has been the condition for three weeks has made dealers more anxious to move the material coming into their hands. We note one sale of about 3000 tons of railroad steel to a local mill at \$19.50, but that is the top of the market on heavy melting grade, sales of which have been made as low as \$19, while one melter reports a purchase of car sides at a price equivalent to about \$18 for heavy melting steel. The market also has slipped on compressed and bundled sheets and on long and short turnings. The principal user of long turnings has established an embargo, while there is not the demand for short turnings there was when coke was high and producing costs could be cut by using that grade. Few scrap dealers are able to make a profit because the consumers have definite limits as to prices and competition for outcoming railroad and industrial scrap is sharp enough to keep primary prices high. Lately this situation has been receiving serious attention and it will be surprising if bids against railroad scrap continue to equal or exceed what can be obtained from consumers. The Norfolk & Western is taking bids until noon, Dec. 9, on 5141 gross tons of scrap.

We quote for delivery to consumer's mill in the Pittsburgh and other districts taking the Pittsburgh freight rate as follows:

Per Gross Ton	
Heavy melting steel.....	\$19.00 to \$19.50
No. 1 cast, cupola size.....	18.00 to 18.50
Rails for rolling, Newark and Cambridge, Ohio; Cumberland, Md.; Huntington, W. Va., and Franklin, Pa.	21.00 to 22.00
Compressed sheet steel.....	18.00 to 18.50
Bundled sheets, sides and ends..	17.00 to 17.50
Railroad knuckles and couplers..	22.00 to 22.50
Railroad coil and leaf springs..	22.00 to 22.50
Low phosphorus blooms and billet ends	24.00 to 24.50
Low phosphorus plates and other material	23.00 to 23.50
Low phosphorus punchings.....	21.00 to 21.50
Railroad malleable	19.50 to 20.00
Steel car axles.....	23.50 to 24.00
Cast iron wheels.....	18.50 to 19.00
Rolled steel wheels.....	22.00 to 22.50
Machine shop turnings.....	14.50 to 15.00
Short shoveling turnings.....	15.00
Sheet bar crops.....	22.00 to 23.00
Heavy steel axle turnings.....	17.00 to 17.50
Short mixed borings and turnings	15.00
Heavy breakable cast.....	18.00 to 18.50
Stove plate	14.50 to 15.00
Cast iron borings.....	14.50 to 15.00
No. 1 railroad wrought.....	15.00 to 15.50
No. 2 railroad wrought.....	19.00 to 19.50

Ore Shipments for 1925 Show Large Gain Over 1924

CLEVELAND, Dec. 8.—One cargo of Lake Superior ore has been shipped this month. This amounted to 7145 tons and was sent from Marquette. There are about 5500 tons of ore left at Escanaba for shipment to East Jordan, Mich., but this is not likely to be shipped this year. The December cargo makes total water shipments for the season of 54,081,224 tons. The all-rail movement for the year is estimated at 1,500,000 tons.

The 1925 record of shipments was exceeded in five previous years, three of these, 1916-18 in war time, with a maximum movement of 64,734,198 tons in 1916. In 1920 shipments were 58,527,226 tons, and in 1923 they were 59,026,092 tons. In between was the lean year of 1921, with shipments of only 22,300,726 tons.

Lake Ore Shipments by Water

	Season, 1925	Season, 1924
Escanaba	5,644,276	4,244,669
Marquette	3,487,896	2,516,548
Ashland	6,664,501	4,807,565
Superior	14,560,477	13,355,214
Duluth	17,707,978	12,882,082
Two Harbors	6,016,096	4,817,494
Total	54,081,224	42,623,572
1925 increase..	11,457,652	

Semi-Finished Steel, Raw Materials, Bolts and Rivets

Semi-Finished Steel F.o.b. Pittsburgh or Youngstown

Billets and Blooms

	Per Gross Ton
Rolling, 4-in. and over.....	\$35.00
Rolling, 2-in. and smaller.....	36.00
Forging, ordinary.....	40.00
Forging, guaranteed.....	45.00

Sheet Bars

	Per Gross Ton
Open hearth or Bessemer.....	\$36.00

Slabs

	Per Gross Ton
8 in. x 2 in. and larger.....	\$35.00
6 in. x 2 in. and smaller.....	36.00

Skelp

	Per Lb.
Grooved	1.90c.
Sheared	1.90c.
Universal	1.90c.

Wire Rods

	Per Gross Ton
*Common soft, base, No. 5 to 1/4-in.....	\$45.00
Common soft, coarser than 1/4-in.....	\$2.50 over base
Screw stock	\$5.00 per ton over base
Carbon 0.20% to 0.40%.....	3.00 per ton over base
Carbon 0.41% to 0.55%.....	5.00 per ton over base
Carbon 0.56% to 0.75%.....	7.50 per ton over base
Carbon over 0.75%.....	10.00 per ton over base
Acid	15.00 per ton over base

*Chicago mill base is \$46. Cleveland mill base, \$45.

Raw Materials

Ores

Lake Superior Ores, Delivered Lower Lake Ports

	Per Gross Ton
Old range Bessemer, 51.50% iron.....	\$4.55
Old range non-Bessemer, 51.50% iron.....	4.40
Mesaba Bessemer, 51.50% iron.....	4.40
Mesaba non-Bessemer, 51.50% iron.....	4.25
High phosphorus, iron 51.50%.....	4.15

Foreign Ore, c.i.f. Philadelphia or Baltimore

	Per Unit
Iron ore, low phos., copper free, 55 to 58% iron in dry Spanish or Algerian.....	9.50c. to 10c.
Iron ore, Swedish, average 66% iron.....	9.50c.
Manganese ore, washed, 51% manganese, from the Caucasus.....	45c.
Manganese ore, Brazilian or Indian, nominal.....	42c.
Tungsten ore, high grade, per unit, in 60% concentrates	\$12.00 to \$13.00

Chrome ore, Indian basic, 48% Cr₂O₃, crude, c.i.f. Atlantic seaboard.....

	Per Lb.
Molybdenum ore, 85% concentrates of MoS ₂ , New York.....	65c. to 70c.

Coke

	Per Net Ton
Furnace, f.o.b. Connellsville prompt	\$3.50 to \$4.00
Foundry, f.o.b. Connellsville prompt	4.75 to 5.50
Foundry, by-product, Ch'go ovens	19.50
Foundry, by-product, New England, del'd	18.00
Foundry, by-product, Newark, del'd	11.52
Foundry, Birmingham	5.75
Foundry, by-product, St. Louis or Granite City.....	10.00

Coal

	Per Net Ton
Mine run steam coal, f.o.b. W. Pa. mines	\$1.50 to \$2.10
Mine run coking coal, f.o.b. W. Pa. mines	2.00 to 2.25
Mine run gas coal, f.o.b. W. Pa. mines	2.00 to 2.25
Steam slack, f.o.b. W. Pa. mines.....	1.40 to 1.50
Gas slack, f.o.b. W. Pa. mines.....	1.50 to 1.60

Ferromanganese

	Per Gross Ton
Domestic, 80%, furnace or seab'd.....	\$115.00
Foreign, 80%, Atlantic or Gulf port, duty paid	115.00

Spiegeleisen

	Per Gross Ton Furnace
Domestic, 19 to 21%.....	\$32.00 to \$34.00
Domestic, 16 to 19%.....	\$1.00 to \$3.00

Electric Ferrosilicon

	Per Gross Ton Delivered
50%	\$85.00
75%	145.00

Per Gross Ton Furnace

	Per Gross Ton
10%	\$42.00
11%	42.00

Bessemer Ferrosilicon

F.o.b. Jackson County, Ohio, Furnace

	Per Gross Ton
10%	\$35.00
11%	37.00

Silvery Iron

F.o.b. Jackson County, Ohio, Furnace

	Per Gross Ton
6%	\$27.50
7%	28.50
8%	29.50
9%	31.00

Other Ferroalloys

Ferrotungsten, per lb. contained metal, del'd	\$1.15 to \$1.20
Ferrochromium, 4% carbon and up, 60 to 70% Cr., per lb. contained Cr. delivered	\$11.50c.
Ferrovandium, per lb. contained vanadium, f.o.b. furnace	\$3.25 to \$4.00
Ferrocobaltititanium, 15 to 18%, per net ton, f.o.b. furnace, in carloads.....	\$200.00
Ferrophosphorus, electrolytic, or blast furnace material, in carloads, 18%, Rockdale, Tenn., base, per net ton.....	\$91.00
Ferrophosphorus, electrolytic, 24%, f.o.b. Anniston, Ala., per net ton.....	\$122.50

Fluxes and Refractories

Fluorspar

	Per Net Ton
Domestic 95% and over calcium fluoride, not over 5% silica gravel, f.o.b. Illinois and Kentucky mines.....	\$17.50
No. 2 lump.....	19.00
Foreign, 85% calcium fluoride, not over 5% silica, c.i.f. Atlantic port, duty paid.....	\$17.00 to \$17.50
Domestic, No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2 1/2% silica, f.o.b. Illinois and Kentucky mines.....	\$32.50

Fire Clay

	Per 1000 f.o.b. Works
	High Duty Moderate Duty
Pennsylvania	\$43.00 to \$46.00 \$40.00 to \$43.00
Maryland	48.00 to 50.00 43.00 to 45.00
Ohio	43.00 to 46.00 40.00 to 43.00
Kentucky	43.00 to 45.00 40.00 to 43.00
Illinois	43.00 to 45.00 40.00 to 43.00
Missouri	40.00 to 43.00 35.00 to 38.00
Ground fire clay, per ton.....	6.50 to 7.50

Silica Brick

	Per 1000 f.o.b. Works
Pennsylvania	\$40.00
Chicago	49.00
Birmingham	54.00
Silica clay, per ton.....	\$8.00 to 9.00

Magnesite Brick

	Per Net Ton
Standard size, f.o.b. Baltimore and Chester, Pa.	\$45.00
Grain magnesite, f.o.b. Baltimore and Chester, Pa.	40.00

Chrome Brick

	Per Net Ton
Standard size	\$48.00

Bolts, Nuts, Rivets and Set Screws

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham and Chicago)

	Per Cent Off List
Machine bolts, small, rolled threads.....	60 and 10
Machine bolts, all sizes, cut threads.....	50, 10 and 10
Carriage bolts, smaller and shorter, rolled threads	50, 10 and 10
Carriage bolts, cut threads, all sizes.....	50 and 10
Eagle carriage bolts.....	65 and 10
Lag bolts	60, 10 and 10
Plow bolts, Nos. 3 and 7 heads.....	50 and 10
(Extra of 20% for other style heads)	
Machine bolts, c.p.c. and t. nuts, 1/4 x 4 in., 45, 10 and 5	45, 10 and 5
Larger and longer sizes.....	45, 10 and 5
Bolt ends with hot-pressed nuts.....	50, 10 and 10
Bolt ends with cold-pressed nuts.....	45, 10 and 5
Hot-pressed nuts, blank and tapped, square, 4c. off list	4c. off list
Hot-pressed nuts, blank or tapped, hexagons, 4.40c. off list	4.40c. off list
C.p.c. and t. square or hex. nuts, blank or tapped	4.10c. off list
Washers*	6.50c. to 6.25c. off list

*F.o.b. Chicago and Pittsburgh.
The discount on machine, carriage and lag bolts is 5 per cent less than above for less than car lots. On hot-pressed and cold-pressed nuts the discount is 25c. less per 100 lb. than quoted above for less than car lots.

Bolts and Nuts

(Quoted with actual freight allowed up to but not exceeding 50c. per 100 lb.)

	Per Cent Off List
Semi-finished hexagon nuts:	
1/2 in. and smaller, U. S. S.....	80, 10 and 5
3/4 in. and larger, U. S. S.....	75, 10 and 5
Small sizes, S. A. E.....	80, 10, 10 and 5
S. A. E., 1/2 in. and larger.....	75, 10, 10 and 5
Stove bolts in packages.....	80, 10 and 5
Stove bolts in bulk.....	80, 10, 5 and 2 1/2
Tire bolts	60 and 5

Semi-Finished Castellated and Slotted Nuts

(Actual freight allowed up to but not exceeding 50c. per 100 lb.)

	Per 100 Net S.A.E. U.S.S.	Per 100 Net S.A.E. U.S.S.
1/4-in.....	\$0.44 \$0.44	1/4-in... \$2.35 \$2.40
1/2-in.....	0.515 0.515	3/4-in... 3.60 3.60
3/4-in.....	0.62 0.66	1-in... 5.65 5.80
1-in.....	0.79 0.90	1 1/4-in... 8.90 8.90
1 1/4-in.....	1.01 1.05	1 3/4-in... 12.60 13.10
1 3/4-in.....	1.33 1.42	2-in... 18.35 18.35
2-in.....	1.70 1.73	2 1/4-in... 21.00 21.00

Larger sizes.—Prices on application.

Large Rivets

	Base Per 100 Lb.
F.o.b. Pittsburgh	\$2.60
F.o.b. Cleveland	\$2.60 to 2.70
F.o.b. Chicago	2.75

Small Rivets

	Per Cent Off List
F.o.b. Pittsburgh	70 and 10
F.o.b. Cleveland	70 and 10
F.o.b. Chicago	70, 10 and 5 to 70 and 10

Cap and Set Screws

(Freight allowed up to but not exceeding 50c. per 100 lb.)

	Per Cent Off List
Milled cap screws.....	80 and 10
Milled standard set screws, case hardened.....	80
Milled headless set screws, cut thread.....	80
Upset hex. head cap screws, U. S. S. thread, 80, 10 and 10	80, 10 and 10
Upset hex. cap screws, S. A. E. thread, 80 and 10	80 and 10
Upset set screws.....	80, 10 and 10 to 80, 10 and 25
Milled studs	70 and 5

Chicago

Steel Orders Entered for Rolling Heaviest of Year—Scrap Weak

CHICAGO, Dec. 8.—Orders placed for finished steel with Chicago district mills during the week were by far the greatest this year. Orders passed to entry at the mills during November were well in excess of those for the previous month, and December so far is leading the past month by a substantial margin. Demand for soft steel bars continues to grow and both new business and specifications for November were 10 to 15 per cent greater than for October. Steel makers report heavier specifications are being received from farm implement and tractor manufacturers. The demand for tractors is unusually heavy and is said to exceed the supply.

Prices of finished steel products are firm here and indications are that they are stiffening in outlying districts. Mill operations are a shade higher at 86 per cent of capacity. The leading producer is blowing 10 stacks at Gary, six at South Chicago and one at Joliet, making 17 in blast out of a total of 27. Adding the furnaces of the independent producers, the total number of active stacks is 25 out of 35 in the Chicago district.

Rail buying during the week was light, although the tonnage placed on books was large because of the formal signing of contracts on distributions previously announced. Track fastenings and supplies were booked in large volume. The principal car award of the week was that of the Wabash for 2000 automobile cars, which were distributed among three builders. The Union Pacific has asked for prices on 2000 freight and 47 passenger cars. Car builders report that Chicago district shops have not more than three months work ahead. Structural awards are still heavy, two Chicago lettings requiring 6600 tons of steel.

The scrap market is weak and transactions are largely between dealers who are filling old obligations.

Pig Iron.—Shipments of pig iron are well maintained and substantially balance the production of the eight Chicago district merchant stacks which are in blast. The inactive furnaces include one at Mayville and one at the Iroquois plant. Indications are that shipments have been going directly into production with melters' stocks averaging less than 30 days. However, as foundries continue to take iron according to schedule, they may increase their stocks somewhat during the inventory and holiday periods. Spot buying is almost at a standstill and dealers do not look for a change in the situation until after the first of the year. High phosphorus, malleable and No. 2 foundry are firm at \$23, base Chicago furnace, this being the price at which the last of first quarter contracts are being taken. A few users have contracted for second quarter iron, although sellers are not urging this upon their customers. A Chicago district melter is expected to close this week for about 1500 tons of foundry and malleable. A Chicago consumer is inquiring for 500 tons of malleable and another will take 500 tons of foundry. Charcoal iron, at \$29.04, delivered Chicago, is somewhat more active and sales to Chicago users total 800 tons. Low phosphorus and 14 to 16 per cent ferrosilicon are quiet, and only a few carlots of silvery have been placed during the week. Reports are current that there has been some trading of pig iron between local mills.

Quotations on Northern foundry, high phosphorus and malleable iron are f.o.b. local furnace, and do not include an average switching charge of 61c. per ton. Other prices are for iron delivered at consumers' yards.

Northern No. 2 foundry, sil. 1.75 to 2.25	\$23.00
Northern No. 1 foundry, sil. 2.25 to 2.75	23.50
Malleable, not over 2.25 sil.	23.00
High phosphorus	23.00
Lake Superior charcoal, averaging sil. 1.50, delivered at Chicago	29.04
Southern No. 2 (all rail)	27.01
Southern No. 2 (barge and rail)	26.18
Low phos., sil. 1 to 2 per cent, copper free	\$31.20 to 31.60
Silvery, sil. 8 per cent.	34.29
Ferrosilicon, 14 to 16 per cent.	45.25 to 45.75

Ferroalloys.—A few carlot sales of ferromanganese are reported in Milwaukee at \$115 seaboard. Several Chicago users have taken carload lots of speigeleisen on the basis of \$34, Hazard, Pa. Fifty per cent ferrosilicon is quiet with 1926 contracts closed at \$85, delivered.

We quote 80 per cent ferromanganese, \$122.56, delivered; 50 per cent ferrosilicon, \$85, delivered; speigeleisen, 18 to 22 per cent, \$41.76, delivered.

Plates.—Mills report a gain over the previous week in both new business and specifications. The most noticeable improvement is in tonnage from car manufacturers who are rapidly getting into production on orders placed during the past month. The most recent car purchase is that of the Wabash, which divided 2000 automobile cars among three builders. The pending list is swelled materially by the announcement that the Pacific Fruit Express has authority to purchase 5000 refrigerator cars and that the Union Pacific will buy 1000 ballast and 1000 automobile cars. The Chicago, Burlington & Quincy is building 500 gondola cars at its Galesburg, Ill., shops, and 480 automobile cars at its Aurora, Ill., shops. At Galesburg production has reached 13 cars a day. This program is one of reconstruction and as one block of 500 cars is finished, work is started on the next group. The cars are being torn down to the trucks and are said to be the equivalent of new cars when placed in service. Plate bookings for tank work are light but a substantial tonnage is still pending.

The mill quotation is 2.10c., Chicago. Jobbers quote 3.10c. for plates out of stock.

Bars.—Demand for soft steel bars continues to grow and makers report that orders entered for rolling are running 10 to 15 per cent ahead of the October average. Specifications and new business are liberal, particularly from manufacturers of farm implements and tractors. These industries are said to be operating at better than 75 per cent capacity and their production is being readily absorbed by both domestic and foreign trade. The demand for tractors is unusually heavy, and is in excess of the supply. Mild steel bars are unchanged, but firm, at 2.10c., Chicago. Rolled bar makers are still supplying a substantial tonnage for reinforcing. The manufacturing trade is specifying liberally and is insistent in its demand for prompt delivery. Mill operations are unchanged and prices are steady at 2c. to 2.10c., Chicago. Bar iron users are specifying more freely and mills report greater interest on the part of the car building industry. Individual orders to date are small and are taken at 2c., Chicago.

Mill prices are: Mild steel bars, 2.10c.; common bar iron, 2c., Chicago; rail steel bars, 2c. to 2.10c., Chicago.

Jobbers quote 3c. for steel bars out of warehouse. The warehouse quotations on cold-rolled steel bars and shafting are 3.60c. for rounds and hexagons and 4.10c. for flats and squares; 4.15c. for hoops and 3.65c. for bands.

Jobbers quote hard and medium deformed steel bars at 2.60c.

Wire Products.—New business and specifications for wire products during November were not as heavy, in the aggregate, as during the preceding month. Forward contracting by the manufacturing trade for the first quarter and for a 60-day period by the jobbing trade is developing in good volume. With mills operating at about 70 per cent, specifications are slightly ahead of shipments. On the whole, mill prices, which are shown on page 1625, exhibit a tendency toward greater firmness.

We quote warehouse prices f.o.b. Chicago: No. 8 black annealed wire, \$3.30 per 100 lb.; common wire nails, \$3.05 per keg; cement-coated nails, \$2.05 to \$2.20 per count keg.

Rails and Track Supplies.—Local mills are rapidly closing contracts on rail distributions previously announced. The Chicago, Burlington & Quincy is said to have placed 25,000 tons of rails, of which 12,000 tons went to the Illinois Steel Co., 8000 tons to the Inland Steel Co. and 5000 tons to the Colorado Fuel & Iron Co. The Grand Trunk has placed 7000 tons with a local mill. Light rails are not in great demand and tonnages placed are small. Business in track supplies has been heavy and Chicago makers have fared well in a large order for tie plates, spikes and bolts placed

by the New York Central. The Baltimore & Ohio tie plate order is said to have been placed with Eastern makers.

Standard Bessemer and open-hearth rails, \$43; light rails, rolled from billets, 1.80c. to 1.90c., f.o.b. maker's mill.

Standard railroad spikes, 2.90c. to 3c. mill; track bolts with square nuts, 3.90c. to 4c. mill; steel tie plates, 2.25c. to 2.35c., f.o.b. mill; angle bars, 2.75c., f.o.b. mill.

Jobbers quote standard spikes out of warehouse at 3.55c., base, and track bolts, 4.55c., base.

Sheets.—Demand is unabated and mills continue to operate at full capacity. Prices are steady at the recent advances. The Steel Corporation, the only maker of tin mill black sheets in this district, is now quoting that commodity at 3.45c., Gary.

Chicago delivered prices from mill, 3.50c. for No. 28 black, 2.65c. for No. 10 blue annealed and 4.75c. for No. 28 galvanized. Delivered prices at other Western points are equal to the freight from Gary plus the mill prices, which are 5c. per 100 lb. lower than the Chicago delivered prices.

Jobbers quote f.o.b. Chicago: 3.50c. base for blue annealed, 4.10c. base for black, and 5.25c. base for galvanized.

Structural Material.—Building construction in Chicago shows no abatement and both lettings and new inquiries are well maintained. The outstanding awards were 4200 tons for the Morton Building and 2500 tons for the Garden Court Apartments. Although fabricators' bids have improved materially of late, there is some complaint that occasional jobs are taken at figures which many shops regard as below the market. It is apparent, however, that practically all shops are anxious to get a fair share of pending tonnage in order to carry them well through the winter months.

The mill quotation on plain material is 2.10c., Chicago. Jobbers quote 3.10c. for plain material out of warehouse.

Billets.—Rolling billets, 4 in. and over, are firm at \$35 per gross ton, base Chicago. Bookings by local producers during the week were in excess of 9000 tons.

Bolts, Nuts and Rivets.—Demand is insistent and well maintained and makers have found it necessary to speed up production. Contracting for the first quarter is well under way at prevailing prices which are shown on page 1627.

Jobbers quote structural rivets, 3.50c.; boiler rivets, 3.70c.; machine bolts up to $\frac{3}{4}$ x 4 in., 50 and 5 per cent off; larger sizes, 50 and 5 off; carriage bolts up to $\frac{3}{4}$ x 4 in., 47½ off; larger sizes, 47½ off; hot-pressed nuts, square, tapped or blank, \$3.25 off; hot-pressed nuts, hexagon, tapped or blank, \$3.75 off; coach or lag screws, 55 and 5 per cent off.

Reinforcing Bars.—Quick service on estimates and quotations is the demand of contractors on fresh projects which, while fairly numerous, are in the main individually small. At the same time, there is an insistent demand for prompt delivery against existing contracts, indicating that contractors are anxious to pour a maximum amount of concrete before extreme cold weather sets in. Tonnage awarded during the week was light, although the trade looks for the early placement of several large contracts by the Chicago Board of Education. Billet steel reinforcing bars are still quoted at 2.60c., Chicago warehouse. Recent lettings and fresh pending work are shown on page 1642.

Cast Iron Pipe.—Pipe makers are still booking a good tonnage, although individual contracts, for the most part, are small. Prices are unchanged at \$42, base Birmingham, for 6-in. and larger diameters. Sandusky, Ohio, closed at \$42, base Birmingham, with the National Cast Iron Pipe Co. for 135 tons of 8 and 12-in. Class B pipe. Mattoon, Ill., purchased 130 tons of 12-in. Class 150 centrifugal pipe from the same company at the current market quotation. South Bend, Ind., is inquiring for 1500 tons of 6 and 8-in. Class B, and Bloomington, Ind., will take tenders on 450 tons of 20-in. Class B.

We quote per net ton, f.o.b. Chicago, as follows:
Water pipe, 4-in., \$54.20; 6-in. and over, \$50.20;
Class A and gas pipe, \$4 extra.

Cold-Rolled Bars.—Demand is unabated and prices are firm. Deliveries on standard sizes are said to be three to four weeks and on special sizes, on which it would be necessary for makers to buy hot-rolled stock, from six to eight weeks.

Coke.—Shipments of by-product foundry coke are well maintained and the ovens are meeting delivery schedules without difficulty. November proved to be

the heaviest month from the standpoint of deliveries so far this year. Prices are unchanged at \$10.50, Chicago ovens, or \$11, delivered in the Chicago switching district.

Old Material.—The market is more or less demoralized, with buyers holding the upper hand. Only one user is in the market for heavy melting steel and tonnages which he will accept on shipments are relatively small. Trading is largely between dealers at \$15.75 and sales to users are small in tonnage and are not bringing above \$16 per gross ton. Foundry grades and specialties are weak and inactive and prices range from 25c. to \$1 below those of a week ago. Electric furnaces are said to be well stocked and have withdrawn from the market. The Great Northern is advertising 3500 tons.

We quote delivery in consumers' yards, Chicago and vicinity, all freight and transfer charges paid for all items except relaying rails, including angle bars to match, which are quoted f.o.b. dealers' yards:

Per Gross Ton	
Iron rails	\$18.00 to \$18.50
Cast iron car wheels	18.50 to 19.00
Relaying rails, 56 lb. to 60 lb.	25.00 to 26.00
Relaying rails, 65 lb. and heavier	26.00 to 31.00
Forged steel car wheels	19.00 to 19.50
Railroad tires, charging box size	19.00 to 19.50
Railroad leaf springs, cut apart	19.25 to 19.75
Rails for rolling	18.75 to 19.25
Steel rails, less than 3 ft.	19.25 to 19.75
Heavy melting steel	15.75 to 16.00
Frogs, switches and guards, cut apart	17.50 to 18.00
Shoveling steel	15.50 to 15.75
Drop forge flashings	12.00 to 12.50
Hydraulic compressed sheets	13.75 to 14.25
Axle turnings	14.00 to 14.50
Steel angle bars	18.50 to 19.00
Steel knuckles and couplers	18.50 to 19.00
Coil springs	19.50 to 20.00
Low phos. punchings	18.00 to 18.50
Machine shop turnings	9.50 to 10.00
Cast borings	13.50 to 13.75
Short shoveling turnings	13.25 to 13.75
Railroad malleable	18.50 to 19.00
Agricultural malleable	17.00 to 17.50

Per Net Ton	
Iron angle and splice bars	17.50 to 18.00
Iron arch bars and transoms	21.00 to 21.50
Iron car axles	26.00 to 26.50
Steel car axles	18.00 to 18.50
No. 1 busheling	12.50 to 13.00
No. 2 busheling	9.25 to 9.75
Pipes and flues	11.00 to 11.50
No. 1 railroad wrought	14.00 to 14.50
No. 2 railroad wrought	14.00 to 14.25
No. 1 machinery cast	17.25 to 17.75
No. 1 railroad cast	16.50 to 17.00
No. 1 agricultural cast	16.50 to 17.00
Locomotive tires, smooth	16.50 to 17.00
Stove plate	14.50 to 15.00
Grate bars	14.50 to 15.00
Brake shoes	14.00 to 14.50

Importers Bid on Subway Rails

NEW YORK, Dec. 8.—Importers are active in quoting on a wide range of materials to numerous consumers. A rail inquiry that is attracting the attention of some importers is the recently issued list of the Interborough Rapid Transit Co., New York, calling for 5000 tons of 100-lb. sections, 500 tons of 90-lb. sections and 10,000 splice bars. Specifications call for open-hearth material and are of the usual Interborough type. The purchaser is understood to have expressed willingness to consider foreign quotations.

Inquiry from foreign markets continues light and the Japanese market, which usually provides some activity, is quiet. A recent award of railroad material was 15 manganese steel, tadpole type switches, placed by Tokio municipality with Suzuki & Co., New York. There are several small inquiries current for tin plate from merchant sources in Japan, but the firmness of the present market here is not conducive to much business.

The budget of the municipality of Tokio, Japan, in the coming year totals 46,880,000 yen, according to information received by the United States Department of Commerce. It is 8,870,000 yen larger than the 1924 budget, the additional appropriation being for increased policing and establishment of additional schools. The municipality of Nagoya has been authorized to issue 7,130,000 yen of bonds for waterworks. It is also reported that approval is imminent on the flotation of 5,600,000 yen of bonds for work on the Nakagawa canal at Nagoya.

Boston

Large Imports of Foreign Coke—Pig Iron Inactive, Scrap Weaker

BOSTON, Dec. 8.—Pig iron remains comparatively quiet. Current sales are confined very largely to small tonnages for mixture purposes, or to replace orders with New York State furnaces, which give little indication of being shipped this year. Prices on Alabama, Virginia, eastern Pennsylvania and Indian iron are steady; yet the pig iron market as a whole is not as firm as a week ago inasmuch as solicitation is more active and foundries are being asked to make offers. The well covered condition of a large number of New England foundries through the first quarter, and a lack of interest in second quarter material are other unsettling factors. Some large consumers, according to present melts, have enough iron to last until June, 1926. Indian prices are steadier than those on other foreign irons because India and Japan are taking supplies that otherwise might come to America. Continental iron is weaker, particularly German, which is offered at less than \$20, c.i.f. Boston and other Atlantic seaboard points.

We quote delivered prices on the basis of the latest sales as follows, having added \$3.65 freight from eastern Pennsylvania, \$4.91 from Buffalo, \$5.92 from Virginia, and \$9.60 from Alabama:

East. Penn., sil. 1.75 to 2.25.....	\$26.65
East. Penn., sil. 2.25 to 2.75.....	27.15
Buffalo, sil. 1.75 to 2.25.....	\$25.91 to 26.91
Buffalo, sil. 2.25 to 2.75.....	26.41 to 27.41
Virginia, sil. 1.75 to 2.25.....	29.92
Virginia, sil. 2.25 to 2.75.....	30.42
Alabama, sil. 1.75 to 2.25.....	31.60 to 32.60
Alabama, sil. 2.25 to 2.75.....	32.10 to 33.10

Cast Iron Pipe.—Bids closed Dec. 7 on 600 tons of 6-in. to 16-in. pipe required by New Britain, Conn. On the same day Providence, R. I., closed bids on about 1400 tons, as previously noted, these two tonnages being the only open municipal business reported. Considerable pipe continues to be placed privately. Prices are firm as follows: 4-in., \$60.10 per net ton, delivered common Boston freight rate points; 6-in. to 16-in., \$56.10; 20-in. and larger, \$55.10.

Finished Material.—The market on plates has advanced from 1.965c. per lb. delivered, to 2.165c., or from 1.60c. to 1.80c., base Pittsburgh. No business of consequence is being booked at 2.165c., however, as old pending contracts at 1.965c. are still accepted. It is reported that there are enough sheets in stock in New England and on order to last through the first quarter. Buyers, with excessive stocks, are said to be offering galvanized sheets at 35c. per 100 lb. below the mill quotations. Bars are in moderate demand at 2.365c. per lb., delivered, and 2.465c., or 2c. and 2.10c., base Pittsburgh. The market for shapes is still 1.90c. to 2c., base Pittsburgh.

Warehouse Business.—The movement of iron and steel out of warehouses holds up well, but average individual orders involve only a small amount of material, and indications are December will be a leaner month than November. Prices on bars, flats, etc., are steady and unchanged. It is intimated wire nails may be weaker. On the other hand, such wire products as cloth and poultry netting are easier.

Warehouse prices on finished material follow:

Steel.—Soft bars, \$3.265 per 100 lb.; flats, \$4.15; plain concrete bars, \$3.265; deformed concrete bars, \$3.265 to \$3.54; angles under 3-in., \$3.265; tees and zees, \$3.415; structurals, angles and beams, \$3.365c.; plates, 1/4-in. and heavier, \$3.365; 1/2-in., \$3.565; tire steel, \$4.50 to \$4.75; open-hearth spring steel, \$5 to \$10; crucible spring steel, \$12; bands, \$4.015 to \$5; hoop steel, \$5.50 to \$6; cold rolled, rounds and hexagons, \$3.95; squares and flats, \$4.45; toe calk steel, \$6.

Iron.—Refined bars, \$3.265 per 100 lb.; best refined, \$4.60; Wayne, \$5.50; Norway, rounds, \$6.60; squares and flats, \$7.10.

Coke.—Approximately 90 per cent of New England foundries have contracted with New England by-product coke makers for first half of 1926 fuel. Some, through pig iron houses, contracted for double their normal requirements because of the coal strike. These duplications are being eliminated rapidly. The Providence Gas Co. is accepting comparatively little business outside of a \$2.52 freight rate zone. Current foundry coke

needs are not particularly pressing. The price on New England by-product fuel is unchanged at \$13, delivered within a \$3.10 freight zone. December deliveries are even more punctual than those during the latter part of November. Connellsville district foundry coke is offered at \$5.50 to \$6, on cars ovens, or \$11.05 to \$11.65, delivered. New England coke producers are meeting increased competition from foreign fuel, but almost exclusively on domestic sizes. German, Scotch and Welsh domestic coke is available here. This coke compares favorably with domestic both in size and analysis. For instance, Scotch stove and nut mixed runs about 2.05 per cent volatile, 87.24 per cent fixed carbon, 10.71 per cent ash, and 0.51 per cent sulphur. It is by-product coke, loaded 2 x 7 1/2 in., and unloads in stove and nut sizes with an occasional large lump. It is sold at \$10.96 a net ton, on cars Mystic Wharf. A 3700-ton cargo was unloaded last week; a second of 4400 tons and a third of 3900 tons are on their way to Boston and a fourth of 4000 tons is loading, a total of 16,000 tons. German domestic coke is offered at \$9.25 a gross ton, c.i.f., in cargo lots. There is no duty on foreign coke.

Old Material.—Business is spotty and largely confined to heavy melting steel and turnings. Prices are not so firm as a week ago, but the market is yet to reflect the full weakness of the Pittsburgh market. Heavy melting steel is generally \$12.50 to \$13, on cars shipping point, although sales at as low as \$12 are noted. A week ago \$12.50 to \$13.25 was the common range of prices paid. Most buyers will not pay more than \$10.25 a ton, on cars, for machine shop turnings, yet 25c. more has been paid. The Boston & Albany Railroad on Dec. 7 closed bids on 500 tons of rerolling rails, 500 tons of scrap rails and approximately 1,000,000 lb. of miscellaneous scrap.

The following prices are for gross ton lots delivered consuming points:

Textile cast	\$20.00 to \$20.50
No. 1 machinery cast.....	19.50 to 20.00
No. 2 machinery cast.....	15.50 to 16.50
Stove plate	14.50 to 15.00
Railroad malleable	19.50 to 20.00

The following prices are offered per gross ton lots f.o.b. Boston rate shipping points:

No. 1 heavy melting steel.....	\$12.50 to \$13.00
No. 1 railroad wrought.....	13.50 to 13.75
No. 1 yard wrought.....	12.50 to 13.00
Wrought pipe (1 in. in diameter, over 2 ft. long).....	12.00 to 12.50
Machine shop turnings.....	10.00 to 10.25
Cast iron borings, chemical....	12.00 to 12.50
Cast iron borings, rolling mill..	9.50 to 10.00
Blast furnace borings and turnings	9.50 to 10.00
Forged scrap	10.25 to 10.75
Bundled skeleton, long.....	10.25 to 10.75
Forged flashings	10.25 to 10.75
Bundled cotton ties, long.....	9.75 to 10.00
Bundled cotton ties, short.....	10.25 to 10.75
Shafting	18.25 to 18.75
Street car axles.....	18.00 to 18.50
Rails for rerolling.....	13.50 to 14.00
Scrap rails	12.50 to 13.00

Cincinnati

Southern Iron Advances—Blue Annealed Sheets Weak

CINCINNATI, Dec. 8.—Despite the fact that buyers are showing but little interest in pig iron, prices are tending upward and Southern makers, both in Alabama and Tennessee, have advanced their quotations \$1 a ton. Furnaces in the Ironton district are still selling foundry grades at \$21, base Ironton, but in some cases consumers have paid \$21.50. Although several Alabama producers have temporarily withdrawn from the market, foundry iron from that State is available at \$22, base Birmingham. Tennessee iron is now bringing \$21, base Birmingham, and a few scattered sales are reported at that figure. Little demand for silvery grades has developed and prices are steady at \$29.50, furnace, for 8 per cent. The largest sale of the week calls for 1000 tons of Northern foundry for first quarter delivery. Several other orders, ranging from 500 to 750 tons each, have been booked by local brokers. Inquiries are scarce and most current business has been obtained by active solicitation. Specifications against contracts are satisfactory and consumers are

taking iron freely. Sales the past week totaled approximately 7000 tons, of which 4500 tons consisted of Northern iron.

Based on freight rates of \$3.69 from Birmingham and \$2.27 from Ironton, we quote f.o.b. Cincinnati:

Alabama fdy., sil. 1.75 to 2.25	
(base)	\$25.69
Alabama fdy., sil. 2.25 to 2.75...	26.19
Tennessee fdy., sil. 1.75 to 2.25...	24.69
Southern Ohio silvery, 8 per cent	31.77
Southern Ohio fdy., sil. 1.75 to 2.25	23.27 to 23.77
South'n Ohio, malleable (nominal)	24.27

Finished Material.—Sellers are well satisfied with the volume of sales in the past week. Specifications against contracts are liberal and in some cases consumers have wired for rush delivery on tonnages scheduled for shipment the latter part of December and the first half of January. Several important mills are refusing to make first quarter contracts except with preferred customers, but have booked a considerable number of orders for delivery next month. A moderate movement of bars is reported, and prices are steady at 2c. to 2.10c., base Pittsburgh. Plate makers are endeavoring to establish 2c., Pittsburgh, as the prevailing price and are consistently quoting that figure. However, the market remains at 1.90c. on the bulk of the tonnage booked. Shapes are firm at 2c., Pittsburgh. While an attempt is being made to secure 2.10c., sellers admit that even small lots cannot be sold at that price at present. Consumers are showing some interest in black sheets which are strong at 3.35c., Pittsburgh, but blue annealed sheets have weakened slightly and quotations of 2.40c., Pittsburgh, have appeared, although the majority of orders are being taken at 2.50c. Galvanized sheets are firm at 4.50c., Pittsburgh. Sheet mills report operations at 87 per cent of capacity. Activity in wire goods has been well sustained with common wire nails selling at \$2.65 per keg, Pittsburgh or Ironton, and plain wire bringing \$2.50 per 100 lb., Pittsburgh or Ironton. The Robertson Steel & Wire Co., Cincinnati, has purchased 1500 tons of wire from an Ironton, Ohio, producer for shipment by barge. Fabricators state that they have a fairly good number of small jobs in their shops. Gas holder companies are operating at capacity on several large contracts.

Reinforcing Bars.—The market remains exceedingly dull. There are only two projects of consequence before the trade and they may not be awarded until January. Prices, however, are holding firm with new billet bars selling at 2c., Cleveland, and rail steel bars at 1.90c., mill.

Warehouse Business.—Sales in the first week of December compare favorably with those in November. Jobbers report an increased demand for bars, plates and sheets, but orders for structural steel have diminished because of unfavorable weather for building operations. Several sellers have advanced black and galvanized sheets, while others have retained their old prices, thereby creating a range of \$3 to \$4 a ton in the quotations on these products. Cement coated nails have been reduced 15c. a keg and are now quoted at \$2.25.

Cincinnati jobbers quote: Iron and steel bars, 3.30c.; reinforcing bars, 3.30c.; hoops, 4c. to 4.25c.; bands, 3.95c.; shapes, 3.40c.; plates, 3.40c.; cold-rolled rounds and hexagons, 3.85c.; squares, 4.35c.; open-hearth spring steel, 4.75c. to 5.75c.; No. 10 blue annealed sheets, 3.60c.; No. 28 black sheets, 4.10c. to 4.30c.; No. 28 galvanized sheets, 5.25c. to 5.40c.; No. 9 annealed wire, \$3 per 100 lb.; common wire nails, \$2.95 per keg base; cement coated nails, \$2.25 per keg; chain, \$7.55 per 100 lb. base; large round head rivets, \$3.75 base; small rivets, 65 per cent off list. Boiler tubes: prices net per 100 ft. lap-welded steel tubes, 2-in., \$18; 4-in., \$38; seamless, 2-in., \$19; 4-in., \$39.

Coke.—Foundry operations are sufficiently heavy to warrant shipments of by-product foundry coke on an extensive scale. The prevalence of mild weather the past week has cut down the demand for domestic grades. Beehive coke has been less active, and only small lots of furnace and foundry grades from the Wise County and New River districts were sold. Prices remain unchanged.

Based on freight rates of \$2.14 from Ashland, Ky., \$3.53 from Connellsville, \$2.90 from New River ovens and \$2.59 from Wise County ovens, we quote f.o.b. Cincinnati: Connellsville foundry, \$9.03 to \$11.03; Wise County foundry, \$8.09 to \$9.59; New River foundry, \$9.90 to \$11.40; by-product foundry, \$10.64.

Old Material.—While the market is lagging, prices are holding well. Portsmouth, Ohio, steel mills have temporarily suspended shipments. The Chesapeake & Ohio is offering a list which includes 1200 tons of axles.

We quote dealers' buying prices, f.o.b. cars, Cincinnati:

Per Gross Ton	
Heavy melting steel.....	\$15.00 to \$15.50
Scrap rails for melting.....	16.00 to 16.50
Short rails.....	19.00 to 19.50
Relaying rails.....	28.00 to 28.50
Rails for rolling.....	16.00 to 16.50
Old car wheels.....	14.50 to 15.00
No. 1 locomotive tires.....	17.50 to 18.00
Railroad malleable.....	16.50 to 17.00
Agricultural malleable.....	16.00 to 16.50
Loose sheet clippings.....	10.00 to 10.50
Champion bundled sheets.....	12.00 to 12.50
Per Net Ton	
Cast iron borings.....	9.50 to 10.00
Machine shop turnings.....	8.50 to 9.00
No. 1 machinery cast.....	20.00 to 20.50
No. 1 railroad cast.....	16.00 to 16.50
Iron axles.....	23.50 to 24.00
No. 1 railroad wrought.....	12.50 to 13.00
Pipes and flues.....	10.00 to 10.50
No. 1 busheling.....	11.50 to 12.00
Mixed busheling.....	10.00 to 10.50
Burnt cast.....	10.50 to 11.00
Stove plate.....	11.50 to 12.00
Brake shoes.....	11.50 to 12.00

Buffalo

Mill Operations at 85 Per Cent—Lackawanna Furnace Lighted

BUFFALO, Dec. 8.—The majority of the pig iron producers in this market are quoting \$22 on foundry and malleable for prompt delivery, if they have it to sell, and \$21 for first quarter, but there are some exceptions. One maker quotes \$21 to \$21.50 for fourth quarter and first quarter delivery and has very little tonnage left for either. The same maker places a price of \$21 on first quarter basic and \$22 for prompt basic. Another producer asks \$21 for prompt foundry and malleable and \$22 for first quarter. Another quotes \$22 for first quarter and has no fourth quarter iron of any kind available. All furnaces expect the market to revive toward the first or middle of January. They believe foundry stocks are low. Current demand for iron is very light. One inquiry for 1250 tons of foundry is the feature of the market, with 5000 tons pending in aggregate. The Bethlehem Steel Co. has just lighted another stack at its Lackawanna works, making five of the nine stacks in blast.

We quote prices f.o.b. gross ton, Buffalo, as follows:

No. 2 plain, sil. 1.75 to 2.25.....	\$21.00 to \$22.00
No. 2X foundry, sil. 2.25 to 2.75...	21.50 to 22.50
No. 1 foundry, sil. 2.75 to 3.25...	22.50 to 23.50
Malleable, sil. up to 2.25.....	21.00 to 22.00
Basic.....	20.00 to 20.50
Lake Superior charcoal.....	29.28

Finished Iron and Steel.—Specifications are being received by local mills in such volume as to insure very satisfactory output throughout the next two months. The average of operations here is not below 85 per cent, and some mills are running at full capacity. Bars are still commanding 2.265c. to 2.365c., Buffalo, with demand good. Shapes range from 2.165c. to 2.265c., delivered Buffalo. The reinforcing bar market is quieter. Several sizable jobs are pending, but they are being held back for one reason or another. Structural steel lettings have declined. One nine-story structural steel office building and theater is in prospect. Warehouse demand is improving.

Warehouse prices are being quoted as follows: Steel bars, 3.30c.; steel shapes, 3.40c.; steel plates, 3.40c.; No. 10 blue annealed sheets, 3.90c.; No. 28 black sheets, 4.60c.; No. 28 galvanized, 5.75c.; cold-rolled shapes, 4.45c.; cold-rolled rounds, 3.95c.; wire nails, 3.90c.; black wire, 3.90c.

Old Material.—The market shows little change. One large mill here is paying \$18 freely for heavy melting steel and is accumulating a quantity, though perhaps not a large tonnage. A Depew consumer purchased approximately 1000 tons recently at a price said to have been between \$19 and \$19.50. All the dealers are busy with orders and a resumption of buy-

ing is expected by the first of January or before. At present the market is very quiet.

We quote prices f.o.b. gross ton, Buffalo, as follows:

Heavy melting steel	\$18.50 to \$19.50
Low phosphorus	20.00 to 21.00
No. 1 railroad wrought	16.50 to 17.00
Car wheels	17.50 to 18.00
Machine shop turnings	12.50 to 13.00
Cast iron borings	12.50 to 13.00
No. 1 busheling	16.50 to 17.50
Stove plate	15.00
Grate bars	14.50 to 15.00
Hand bundled sheets	13.00 to 13.50
Hydraulic compressed	16.50 to 17.50
No. 1 machinery cast	17.50 to 18.00
Railroad malleable	20.00 to 21.00
No. 1 cast scrap	17.50 to 18.00
Iron axles	26.00 to 27.00
Steel axles	20.00 to 21.00

San Francisco

Mill Prices Untested—New Controversy on Mokelumne Project

SAN FRANCISCO, Dec. 5 (*By Air Mail*).—The outstanding developments of the week have been an increase in fabricated bookings, the disinclination of buyers to test the strength of new mill quotations on shapes and plates, and a renewal of the controversy over the Mokelumne River pipe line job. While the most active department of the market is fabricated business, there has been little new buying of shapes since the advance of \$2 a ton a week ago.

In regard to the Mokelumne River project, preliminary work has been started, but no permits have yet been issued to the East Bay Municipal Utility District, Oakland, Cal., by either the Federal Power Commission or the State Division of Water Rights. The Manufacturers' Association of Alameda County has entered into public controversy with the directors of the utility district on the practicability of tapping the Mokelumne River at the proposed Lancha Plana dam site, and also on various other matters connected with financial and engineering policies of the district. There seems to be every indication that the municipal project will be carried out, but work on the major portion of it is not expected to be undertaken until the State and Federal permits have been officially delivered.

Pig Iron.—Present buying is confined almost exclusively to small and scattered lots. However, indications point to a substantial volume of business for the first quarter. Prices remain unchanged.

*Utah basic	\$27.00 to \$28.00
*Utah foundry, sil. 1.75 to 2.25	27.00 to 28.00
**English foundry	26.00
**Belgium foundry	24.50 to 25.00
**Dutch foundry	24.00
**Indian foundry	24.00 to 25.00
**German foundry	25.00

*Delivered San Francisco.

**Duty paid, f.o.b. cars San Francisco.

Shapes.—Lettings of fabricated steel during the week total 2150 tons, and fresh inquiries call for 4090 tons. The two largest inquiries are: 1100 tons for a theater in Los Angeles, and 1000 tons for the Western Pacific Railroad, San Francisco. The largest letting, 500 tons, for the Skinner Building, Portland, Ore., was taken by the Hofius Steel & Equipment Co., Seattle, Wash. The Union Iron Works, Los Angeles, booked 400 tons for the Santa Barbara Elks Club, and 400 tons for the Inspiration Copper Co., Miami, Ariz. The Moore Dry Dock Co. is low bidder on two ferry boats for the Key System Transit Co., Oakland, Cal., which will require 2000 tons of plates and shapes. There has been no recent buying of importance in plain material, and so the new quotations put into effect a week ago have not been tested. Most Eastern mills continue to quote 2.35c. to 2.40c., c.i.f. Coast ports.

Plates.—Buyers seem little inclined to test Eastern mill quotations since the advance of a week ago. Consequently most of the mills are asking 2.30c. to 2.35c., c.i.f. Coast ports. However, 2.25c. is understood to have been named, and some buyers entertain the opinion that 2.20c. is still possible on desirable tonnages. Practically all of the awards of fabricated work during the

week have called for less than 100-ton lots, and no fresh inquiries of importance have come up for figures.

Bars.—In the absence of fresh inquiries and lettings for reinforcing bars, local jobbers are again confronted with the problem of price shading. In view of the fact that there have been no inquiries for large tonnages during the week, most of the present evidence of price concessions seems to be confined to quotations on less-than-carload lots. While 3.40c., base, per lb. is still being asked, a small lot was sold during the week at 3.10c., and 2.85c. is understood to have been quoted. Jobbers continue to ask 2.95c. on 250-ton lots, and 3.10c. on carload lots, but because of the small buying that is being done, it is assumed that these are maximum quotations and that the minimum figure at which concrete bars may be bought depends on the tonnage involved and the service required.

Warehouse Business.—Buying during the week has been less active, although jobbers report that the general volume of sales still continues larger than it was a year ago. Prices are unchanged.

Merchant bars, \$3.30 base, per 100 lb.; merchant bars, $\frac{3}{4}$ in. and under, rounds, squares and flats, \$3.80 base, per 100 lb.; soft steel bands, \$4.15 base, per 100 lb.; angles, $\frac{3}{4}$ in. and larger x $1\frac{1}{2}$ in. to 2 $\frac{1}{2}$ in., inc., \$3.30 base, per 100 lb.; channels and tees, $\frac{3}{4}$ in. to 2 $\frac{1}{2}$ in., inc., \$3.90 base, per 100 lb.; angles, beams and channels, 3 in. and larger, \$3.30 base, per 100 lb.; tees, 3 in. and larger, \$3.30 base, per 100 lb.; universal mill plates, $\frac{1}{4}$ in. and heavier, stock lengths, \$3.30 base, per 100 lb.; spring steel, $\frac{1}{4}$ in. and thicker, \$6.30 base, per 100 lb.; wire nails, \$3.50 base, per 100 lb.; cement coated nails, \$3 base, per 100 lb.; No. 10 blue annealed sheets, \$3.75 per 100 lb.; No. 28 galvanized sheets, \$6 per 100 lb.; No. 28 black sheets, \$4.75 per 100 lb.

Cast Iron Pipe.—The city of Los Angeles has placed 1780 tons, called for under Specification 781-A, with the American Cast Iron Pipe Co. Bids have been rejected by the city of San Diego, Cal., on 200 tons required for city work. A San Francisco firm handling French pipe is understood to have been the low bidder. Prices remain unchanged at \$50 to \$52.50, water shipment, San Francisco.

Tin Plate.—The Standard Oil Co. of California, San Francisco, has placed 175,000 base boxes with an unnamed Eastern independent mill.

Rails and Track Supplies.—The Southern Pacific Co., San Francisco, has placed 1500 to 2000 tons of girder rails with an unnamed Eastern independent mill.

Nails.—The California Packing Corporation, San Francisco, has placed 15,000 kegs of cement coated nails with two unnamed mills.

Sheets.—Jobbers are beginning to specify their requirements for the first quarter, and there seems to be more general interest in sheets than there has been in several weeks. Eastern mills are quoting as follows: Blue annealed sheets, 2.40c. to 2.50c., base, Pittsburgh; black sheets, 3.25c. to 3.35c., and galvanized sheets, 4.50c. to 4.60c.

Coke.—Fresh shipments from England and the Continent are expected at this port in the near future. Present buying is principally in small lots. Prices are unchanged, local importers quoting as follows:

English beehive, \$15 to \$16 at incoming dock, and English by-product, \$12 to \$14; German by-product, \$11.50 to \$12.

Birmingham

Alabama Pig Iron Production Expected to Exceed That of 1924

BIRMINGHAM, Dec. 8.—Sales of pig iron have been light recently, but furnaces are virtually out of the market. Production is being maintained at a steady pace and shipments are heavy, with melt in this district unabated. The market is unchanged at \$22 to \$23, base Birmingham, though the latter price governs most current business, which is confined principally to small lots for immediate delivery. Several of the larger melters apparently have large requirements to protect and are pressing for deliveries. Monthly output in Alabama is above 234,000 tons, and this will

probably be exceeded this month, as there have been no requests for suspension of shipments with the approach of the holidays. According to present estimates the total production of iron in Alabama for the year will materially exceed the 1924 output of 2,773,826 tons. Inquiries for the second quarter of 1926 are reported but no sales for that delivery have been consummated. One furnace is said to have made a large sale of basic the latter part of last week. The Sloss-Sheffield Steel & Iron Co. is still preparing to put in its second Sheffield, Ala., furnace, which will give it seven stacks on foundry iron. The Woodward Iron Co. has all five of its furnaces on foundry.

We quote per gross ton, f.o.b. Birmingham district furnaces, as follows:

No. 2 foundry, 1.75 to 2.25 sil...	\$22.00 to \$23.00
No. 1 foundry, 2.25 to 2.75 sil...	22.50 to 23.50
Basic	22.00
Charcoal, warm blast	30.00 to 32.00

Rolled Steel.—Mill operations and shipments are well maintained. Fabricating plants are operating at capacity on large commitments both in this district and in other sections of the country. The Southern Steel Works, Inc., is rushing deliveries of the structural steel for the new pipe shop of the American Cast Iron Pipe Co., and has begun on the fabrication of 200 tons for a new vaudeville-picture theater here. Considerable Florida tonnage is still being booked. Plates are held at 2.05c. to 2.15c., base Birmingham; soft steel bars at 2.15c. to 2.25c., and structural shapes at 2.05c. to 2.15c.

Cast Iron Pipe.—All cast iron pressure pipe shops here are operating practically at capacity and shipments are such as to prevent the accumulation of pipe. Florida is taking much tonnage in both pressure and soil pipe. A city in an adjoining State is receiving bids on several miles of pipe, ranging in size from 2 to 8 in. Large specifications are reported and the trade expects pressure to be well distributed throughout the winter.

Coke.—All by-product coke plants in the district are producing at capacity and many of the beehive ovens are making coke. Every ton of the product is finding a ready sale when offered on the open market, while the needs of the iron and steel companies are heavy. Quotations are firm at \$5.75 to \$6, local ovens, with 50c. additional asked on spot coke. Box cars are being used in the shipment of coke to Chicago, Detroit and other sections outside of this territory, this being done to keep open top equipment here. Temporary rates, until Feb. 28, are in effect on coke for shipment from Birmingham to Detroit and other Michigan points.

Old Material.—Despite a weakening in the market, a large quantity of iron and steel scrap is still moving and many orders are to be filled. Dealers are still holding to the prices of a week ago and are not pressing for new business. Scrap consumption remains large.

We quote per gross ton, f.o.b. Birmingham district yards, as follows:

Cast iron borings, chemical	\$15.00 to \$16.00
Heavy melting steel	14.00 to 14.50
Railroad wrought	13.00 to 13.50
Steel axles	19.00 to 20.00
Iron axles	18.00 to 19.00
Steel rails	14.00 to 14.50
No. 1 cast	17.00 to 17.50
Tramcar wheels	17.00 to 17.50
Car wheels	16.00 to 16.50
Stove plate	14.00 to 14.50
Machine shop turnings	8.00 to 8.50
Cast iron borings	8.00 to 8.50
Rails for rolling	17.50 to 18.00

Ford Company Now Rolling from Purchased Ingots

DETROIT, Dec. 8.—The Ford Motor Co. has placed in operation the blooming and bar mill units of its new steel works at the River Rouge plant. This has a rated capacity of 20,000 tons per month. The bar mills are continuous and the entire plant is electrically driven.

Except for a relatively small tonnage of electric steel, the Ford company does not produce steel at present and is purchasing ingots from a number of outside sources. This will continue until about April 1, when its open-hearth capacity will be ready.

St. Louis

Missouri Pacific Buys Tie Plates—Pig Iron and Scrap Quiet

ST. LOUIS, Dec. 8.—The approach of the inventory period is reflected in a slowing down of inquiries and sales of pig iron, small lots for prompt shipment constituting virtually all of the week's transactions. The market is strong, but unchanged. Industrial activity in this section has been favorably affected recently by the placement of railroad car orders. Gray iron foundries are especially busy, but are covered for their pig iron requirements well into the first quarter, and are interested chiefly in getting shipments.

We quote delivered consumers' yards, St. Louis, as follows, having added to furnace prices \$2.16 freight from Chicago, \$4.42 from Birmingham, all rail, and 81c. average switching charge from Granite City:

Northern fdy., sil. 1.75 to 2.25..	\$25.66
Northern malleable, sil. 1.75 to 2.25	25.66
Basic	25.66
Southern fdy., sil. 1.75 to 2.25..	\$25.42 to 26.42
Granite City iron, sil. 1.75 to 2.25. 24.31 to 24.81	

Finished Iron and Steel.—The Missouri Pacific placed an order for between 2,500,000 and 3,000,000 tie plates with the Illinois Steel Co., Inland Steel Co., Colorado Fuel & Iron Co., Tennessee Coal, Iron & Railroad Co. and Scullin Steel Co. Inquiries have been received here for 150 tons of reinforcing bars for the Amakomy Building, Memphis, Tenn. Representatives of steel mills report that November was a very satisfactory month in sales, and that business so far in December has been in good volume.

For stock out of warehouse we quote: Soft steel bars, 3.15c. per lb.; iron bars, 3.15c.; structural shapes, 3.25c.; tank plates, 3.25c.; No. 10 blue annealed sheets, 3.60c.; No. 28 black sheets, cold rolled, one pass, 4.60c.; galvanized sheets, No. 28, 5.70c.; black corrugated sheets, 4.65c.; galvanized, 5.75c.; cold-rolled rounds, shafting and screw stock, 3.75c.; structural rivets, 3.65c.; boiler rivets, 3.85c.; tank rivets, $\frac{7}{8}$ in. diameter and smaller, 70 per cent off list; machine bolts, 55 per cent; carriage bolts, 50 and 5 per cent; lag screws, 55½ per cent; hot-pressed nuts, square, \$3.25; hexagon, blank or tapped, \$3.75 off list.

Coke.—November was the heaviest month on record for shipments of domestic coke by local by-product ovens, although unseasonably warm weather has been holding down sales and specifications. Foundry coke continues active, with demand slightly in excess of supply. Some Southern metallurgical coke is coming in.

Old Material.—The market is dull. Consumers in the St. Louis industrial district are well covered on their requirements for the next few months, and will not make further contracts until after inventory taking is over. Mills are concerned mostly with reducing stocks as much as possible. The only railroad lists are the St. Louis-San Francisco, 750 tons, and Chicago & Eastern Illinois, 700 tons.

We quote dealers' prices f.o.b. consumers' works, St. Louis industrial district and dealers' yards, as follows:

Per Gross Ton	
Iron rails	\$15.00 to \$15.50
Rails for rolling	19.25 to 19.75
Steel rails less than 3 ft.	19.25 to 19.75
Relaying rails, 60 lb. and under..	24.00 to 25.00
Relaying rails, 70 lb. and over..	30.00 to 31.00
Cast iron car wheels	18.00 to 18.50
Heavy melting steel	15.50 to 15.75
Heavy shoveling steel	15.50 to 15.75
Frogs, switches and guards cut apart	18.00 to 18.50
Railroad springs	19.00 to 19.50
Heavy axles and tire turnings...	13.25 to 13.75
No. 1 locomotive tires	17.00 to 17.50

Per Net Ton	
Steel angle bars	15.50 to 16.00
Steel car axles	18.00 to 18.50
Iron car axles	25.25 to 25.75
Wrought iron bars and transoms	20.00 to 20.50
No. 1 railroad wrought	13.50 to 14.00
No. 2 railroad wrought	13.75 to 14.25
Cast iron borings	11.50 to 12.00
No. 1 busheling	12.00 to 12.50
No. 1 railroad cast	15.50 to 16.00
No. 1 machinery cast	17.00 to 17.50
Railroad malleable	15.00 to 15.50
Machine shop turnings	9.00 to 9.50
Bundled sheets	9.25 to 9.75

New York

Plate and Sheet Advances Not Firmly Established—Pig Iron Demand Fair

NEW YORK, Dec. 8.—Although melters of pig iron are showing less interest in the market as the inventory period approaches, sales for the week were in surprisingly good volume, aggregating close to 7500 tons. Individual purchases, however, were small, rarely calling for more than 500 tons and in no case exceeding 1000 tons. Requests for suspension of shipments, which are normally fairly numerous at this time of the year, are notably few. In fact, there seems to be every evidence of a well sustained melt in this district. The fuel situation is still being watched by buyers for any signs of renewed strength which might affect pig iron prices. Meanwhile prices of both domestic and foreign irons remain substantially unchanged. Sales of German iron have been in fair volume at \$22.00 to \$22.50, c.i.f. port of entry, duty paid. Virginia iron is again bringing \$24, base furnace. Tardy delivery of coke has again delayed the blowing in of the No. 2 furnace at Port Henry, N. Y.

We quote delivered in the New York district as follows, having added to furnace prices \$2.52 freight from eastern Pennsylvania, \$4.91 from Buffalo and \$5.54 from Virginia:

East. Pa. No. 2, sil. 1.75 to 2.25..	\$25.52
East. Pa. No. 2X fdy., sil. 2.25 to 2.75	\$25.52 to 26.02
East. Pa. No. 1X fdy., sil. 2.75 to 3.25	26.02 to 26.52
Buffalo, sil. 1.75 to 2.25	25.91 to 26.91
No. 2 Virginia, sil. 1.75 to 2.25..	29.54

Ferroalloys.—Outside of quiet negotiating, of which there is believed to be considerable, the ferromanganese market is inactive. There is not much definite inquiry and very few sales of any consequence reported. Only a moderate business has been done, mostly for shipment in the first part of next year. The same situation prevails in the spiegeleisen market. Prices for both alloys continue firm and unchanged.

Warehouse Business.—While business is continuing on a basis comparable to the November activity, most jobbers expect a gradual decline in demand as the end of the year approaches. Inquiries for even small lots of structural material are scarce. The sheet market continues unchanged at 4.35c. to 4.50c. per lb., base for black and 5.35c. to 5.50c. per lb., base for galvanized. Demand is moderate and little or no change is expected in prices in the next few weeks. Some non-ferrous metals are slightly weaker. Prices on page 1656. We quote boiler tubes per 100 ft., as follows:

Lap welded steel tubes, 2-in., \$17.33; seamless steel, 2-in., \$20.24; charcoal iron, 2-in., \$25; 4-in., \$37.

Finished Iron and Steel.—The interesting developments of the week are the efforts of eastern Pennsylvania plate mills to raise their prices \$3 or \$4 a ton (which have not yet met with complete success), and a slight weakening in the prices of sheets, due to quotations of one or two independent mills about \$2 a ton below the established quotations of other mills. All of the Eastern plate mills are quoting 1.80c., Pittsburgh, or 2.14c., New York, for first quarter, but one or two have made sales within the week for prompt specification at 1.60c., Pittsburgh. Some plate and structural fabricators got under cover at 1.60c. on work which will require deliveries in January. On good-sized lots of plates—that is 100 to 500 tons or more—it is possible to obtain quotations of 1.60c. to 1.70c., Pittsburgh, if specifications accompany the order. Lots as small as 30 tons have been sold at 1.60c., but all mills are showing an inclination to get away from this low level. Galvanized sheets have been quoted in a number of instances at 4.50c., Pittsburgh, black sheets at 3.25c. and blue annealed at 2.40c. The general run of quotations are \$2 higher. Sheet business is in smaller proportions due to the fact that most consumers covered their forward requirements before the advance. Steel bars remain at 2c., Pittsburgh, for delivery through first quarter, and the range of quotations on structural shapes to the end of the first quarter is 1.90c. to 2c., Pittsburgh, with concessions

from these figures becoming less frequent. Structural steel lettings have been relatively light during the past week, but a good deal of tonnage is pending on which decision is expected shortly. Large inquiries for railroad freight cars, including 10,000 for the Chesapeake & Ohio, are expected soon.

We quote for mill shipments, New York delivery, as follows: Soft steel bars, 2.34c. to 2.44c.; plates, 2.04c. to 2.14c.; structural shapes, 2.24c. to 2.34c.; bar iron, 2.24c.

Cast Iron Pipe.—Heavy demand for gas pipe from private sources continues but current business in water pipe has declined with the usual dull season at hand. The 25,000 tons of gas pipe for the American Gas & Electric Co. is reported as about to be placed with the United States Cast Iron Pipe & Foundry Co. Water pipe prices continue firm and unchanged except when foreign competition is encountered. A recent award was 200 tons of 6, 8 and 10-in. pipe by Yonkers, N. Y., to the Warren Foundry & Pipe Co. Providence, R. I., opens the second set of bids on about 1000 tons of 6 to 16-in. water pipe tomorrow. Pont-a-Mousson works was low on the first opening, but all bids were rejected. Although the higher market on soil pipe is being maintained on a certain percentage of current business, the old discounts of 45 per cent off on light and 55 per cent off on heavy pipe are still obtainable. The market shows more activity and sales for December and January delivery are being made.

We quote pressure pipe per net ton, f.o.b. New York, in carload lots, as follows: 6-in. and larger, \$50.60 to \$52.60; 4-in. and 5-in., \$55.60 and \$57.60; 3-in., \$65.60 to \$67.60, with \$5 additional for Class A and gas pipe. Discounts both of Northern and of Southern makers of soil pipe, f.o.b. New York, are as follows: 6-in., 42½ to 43¼ per cent off list; heavy, 52½ to 53¼ per cent off list.

Coke.—Quotations on foundry, furnace and domestic sizes are practically unchanged. Foundry coke continues firm at \$6.50 to \$7 per ton. By-product is unchanged at \$11.52 per ton, delivered Newark and Jersey City, N. J.

Old Material.—The tension of a rapid upward movement on all grades has relaxed somewhat and slight weakness is evident in spots. While buying prices of No. 1 heavy melting steel are substantially unchanged, it is noteworthy that some brokers are offering 25c. to 50c. per ton less than a week ago and a fair range of the market today is \$16.75 to \$17.25 per ton, delivered to eastern Pennsylvania consumers. A Phoenixville Pa., consumer has reduced prices on bundled skeleton machine shop turnings and stove plate by 50c. per ton to \$15 delivered and as a result brokers are in most instances offering 50c. per ton less on this delivery. Heavy breakable cast continues strong and brokers shipping to a consumer at Florence, N. J., are offering up to \$17.75 per ton delivered on this grade.

Buying prices per gross ton New York follow:

Heavy melting steel (yard)....	\$11.75 to \$12.25
Heavy melting steel (railroad or equivalent)	13.50 to 14.00
Rails for rolling	14.50 to 15.00
Relaying rails, nominal	23.00 to 24.00
Steel car axles	22.00 to 22.50
Iron car axles	24.50 to 25.00
No. 1 railroad wrought	15.00 to 15.50
Forge fire	11.50 to 12.00
No. 1 yard wrought, long	14.50 to 15.00
Cast borings (steel mill)	10.25 to 11.25
Cast borings (chemical)	14.00 to 14.50
Machine shop turnings	11.00 to 11.50
Mixed borings and turnings	10.50 to 11.00
Iron and steel pipe (1 in. diam., not under 2 ft. long)	12.75 to 13.25
Stove plate (steel mill)	10.75 to 11.25
Stove plate (foundry)	12.00 to 12.25
Locomotive grate bars	11.50 to 12.00
Malleable cast (railroad)	16.50 to 17.50
Cast iron car wheels	14.50 to 15.00
No. 1 heavy breakable cast	14.00 to 15.00

Prices which dealers in New York and Brooklyn are quoting to local foundries per gross ton follow:

No. 1 machinery cast	\$18.50 to \$19.00
No. 1 heavy cast (columns, building material, etc.), cupola size	17.00 to 17.50
No. 2 cast (radiators, cast boilers, etc.)	16.00 to 16.50

Another open-hearth furnace has been added to the active units at the Farrell, Pa., plant of the Carnegie Steel Co., giving the company 10 active open-hearth furnaces at that property, its best operating schedule in several months.

Philadelphia

Buys 45,000 Tons of Basic Iron—Specify Steel at November Rate

PHILADELPHIA, Dec. 8.—The purchase of 45,000 tons of basic pig iron by an Eastern plate manufacturer was the only important business in this market during the week. Otherwise pig iron buying has been of small proportions, but most of the active furnaces are now well sold up through first quarter and some have very little, if any, iron left for that period.

Steel specifications have been coming in at about the November rate, and in the case of two or three of the Eastern plate mills, the tonnage is larger than last month's daily average. The recent advance in prices by Eastern plate mills undoubtedly accounts in part for the increased volume. Most of the Eastern steel mills are operating at 75 to 80 per cent, and the outlook for continued high operation through all or most of first quarter is now considered excellent. Only in scrap has any signs of weakness appeared, and this is mainly due to the fact that the mills are well covered to the end of the year and the scrap market is quick to reflect even a temporary lack of interest on the part of consumers.

Pig Iron.—An Eastern plate manufacturer has bought from three eastern Pennsylvania furnaces a total of 45,000 tons of basic iron for first quarter delivery. This consumer estimates its first quarter requirements at 50,000 tons, based on the rate at which orders for plates are now being received. One furnace company will supply about 30,000 tons and the remainder was divided about evenly between the other two furnaces. The price paid is reported to have been \$22.50, delivered, which is 50c. a ton below smaller sales made in the previous week. This purchase, however, absorbed virtually all of the basic iron that active furnaces in this district could offer for first quarter. On a few thousand tons remaining unsold the furnace quotation now would probably be not less than \$23.50 to \$24, delivered. One furnace company did not quote on the plate manufacturer's inquiry, having no basic iron to offer for first quarter. Orders for foundry iron are small and not numerous, but foundrymen are pressing for shipments and the iron being made is rapidly going into consumption. Furnaces scheduled to go in blast are the Hokendauqua stack of the Reading Iron Co., and a furnace at Port Henry, N. Y., the latter being due to go in this week. Considerable quantities of English iron are being sold and other foreign iron is being readily disposed of. Little or no Indian iron is to be had for early delivery. Quotations on foreign foundry iron range from \$21 to \$23, duty paid Philadelphia, depending on the quality of the iron. On domestic foundry iron the market is firm at \$23, furnace, for the base grade. Low phosphorus iron is being quoted at \$22 to \$24, furnace, the f.o.b. price depending on the distance the iron has to be shipped.

The following quotations are, with the exception of those on low phosphorus iron, for delivery at Philadelphia and include freight rates varying from 76c. to \$1.63 per gross ton:

East. Pa. No. 2 plain, 1.75 to 2.25 sil.	\$23.76 to \$24.13
East. Pa. No. 2X, 2.25 to 2.75 sil.	24.26 to 24.63
East. Pa. No. 1X.	24.76 to 25.13
Virginia No. 2 plain, 1.75 to 2.25 sil.	27.67 to 28.67
Virginia No. 2X, 2.25 to 2.75 sil.	28.17 to 29.17
Basic, delivered eastern Pa.	23.00 to 23.50
Gray forge	23.00 to 23.50
Malleable	24.00 to 25.00
Standard low phos. (f.o.b. furnace)	24.00 to 25.00
Copper bearing low phos. (f.o.b. furnace)	24.50

Ferroalloys.—Moderate sized lots of ferromanganese are being sold at the price which has been in effect for some time, namely, \$115 for both foreign and domestic alloy.

Billets.—For prompt specification billets of rerolling quality are still available at \$35, Pittsburgh, but \$36 is being asked for first quarter and has been paid in a number of instances. For forging quality the price is \$5 higher.

Plates.—Eastern plate mills are now uniformly quoting 1.80c. per lb., Pittsburgh, for first quarter, though lower prices are still occasionally quoted on material specified for rolling this month. Although a few sales at 1.60c. have been made within the past week, this price is said to be no longer obtainable on new business and the minimum is now 1.70c., at which price some sales for December rolling have been entered. However, an increasing amount is being booked at 1.80c. and the prospect is that before the end of this week all mills will be quoting that price even for this month. A further advance to 1.90c. is held out by the mills as likely. About 2000 tons of plates will be required by the Baldwin Locomotive Works for 50 locomotives to be built for the Seaboard Air Line.

Structural Material.—With full order books, the structural mills are not so willing to make price concessions, and the minimum even on desirable tonnage is now nearer to 1.90c. It is probable that very few concessions from that figure are now obtainable. Some mills are talking of 2c. on first quarter business, but contracts are being closed at 1.90c. with the larger users. A large volume of structural steel work is pending, but lettings in the past week have been few.

Bars.—Mills continue to make first quarter contracts for steel bars at 2c., Pittsburgh, and although some quotations of 2.10c. are reported, not much business has been closed at the latter figure. The effort of the mills is to get the higher price on small lots. Bar iron remains at 2.20c., Philadelphia.

Sheets.—Reports indicate that not all of the independent sheet mills are adhering to the new prices, concessions of \$2 a ton having been offered in a number of cases. These quotations have been traced to one or two sources. As most consumers have covered their requirements for first quarter, the volume of new buying is small. For sheet prices see page 1625.

Old Material.—The lull in scrap buying of the past two weeks has brought about weakness in prices. This has not yet resulted in any important price changes, but the trade is expecting a slight dip before the expected January buying sets in. Small sales of heavy melting steel have been made within the week at \$17.50 and \$18. The principal steel works consumer of bundled sheets and machine shop turnings has dropped its price to \$15. Another consumer of these grades has paid \$15.50 for small lots.

We quote for delivery, consuming points in this district, as follows:

No. 1 heavy melting steel	\$17.50 to \$18.00
Scrap rails	17.00 to 17.50
Steel rails for rolling	18.50 to 19.00
No. 1 low phos. heavy 0.04 and under	22.00 to 22.50
Couplers and knuckles	21.00 to 21.50
Rolled steel wheels	21.00 to 21.50
Cast iron car wheels	18.50 to 19.00
No. 1 railroad wrought	18.50 to 19.00
No. 1 yard wrought	17.00 to 17.50
No. 1 forge fire	15.50 to 16.00
Bundled sheets (for steel works)	15.00 to 15.50
Mixed borings and turnings (for blast furnace)	13.50 to 14.50
Machine shop turnings (for steel works)	15.00 to 15.50
Machine shop turnings (for rolling mill)	15.50 to 16.00
Heavy axle turnings (or equivalent)	15.50 to 16.00
Cast borings (for steel works and rolling mill)	15.00
Cast borings (for chemical plant)	17.00 to 17.50
No. 1 cast	18.00 to 19.00
Heavy breakable cast (for steel works)	17.50 to 18.00
Railroad grate bars	15.00 to 15.50
Stove plate (for steel works)	15.00 to 15.50
Wrought iron and soft steel pipes and tubes (new specifications)	17.00 to 17.50
Shafting	23.00 to 24.00
Steel axles	24.00 to 25.00

Imports.—A large amount of pig iron has recently been coming from England, last week's receipts totaling 8076 tons. Other pig iron imports were 507 tons from India and 300 tons from the Netherlands. Iron ore was received as follows: From Sweden, 6800 tons; from Germany, 370 tons, and from Spain, 240 tons. Manganese ore imports were confined to one lot of 1962 tons from British West Africa.

Warehouse Business.—Concessions on steel bars

have been offered by one or two warehouses. The nominal price is 3.20c. Other products are holding to the quoted prices. For local delivery warehouses quote as follows:

Soft steel bars and small shapes, 3.20c.; iron bars (except bands), 3.20c.; round edge iron, 3.50c.; round edge steel, iron finished, $1\frac{1}{2}$ x $\frac{1}{2}$ in., 3.50c.; round edge steel, planished, 4.30c.; tank steel plates, $\frac{1}{4}$ in. and heavier, 2.80c. to 3c.; tank steel plates, $\frac{1}{4}$ in., 3c.; blue annealed steel sheets, No. 10 gage, 3.50c.; black sheets, No. 28 gage, 4.65c.; galvanized sheets, No. 28 gage, 5.85c.; square, twisted and deformed steel bars, 3c.; structural shapes, 2.75c. to 2.90c.; diamond pattern plates, $\frac{1}{4}$ in., 5.30c.; $\frac{1}{2}$ in., 5.50c.; spring steel, 5c.; rounds and hexagons, cold-rolled steel, 4c.; squares and flats, cold-rolled steel, 4.50c.; steel hoops, 4.25c.; base; steel bands, No. 12 gage to $\frac{1}{4}$ in., inclusive, 3.90c.; rails, 3.20c.; tool steel, 8.50c.; Norway iron, 6.50c.

Cleveland

Year End Reaction in Steel Business— Nickel Plate Rail Inquiry

CLEVELAND, Dec. 8.—There has been some slowing down in the steel business, both in new commitments and in specifications. This appears to be due to the fact that most consumers are now under contract for the first quarter and that some buyers are holding back on orders so that deliveries will be deferred until after the inventory period. In a few cases, mills have been requested to hold up shipments until after inventories. However, orders booked by some of the mills show no falling off. Producers generally have good specifications for January shipment or at their convenience. Deliveries on steel bars have become more extended.

Detroit automobile companies placed considerable business during the week in bars, sheets and hot and cold-rolled strip steel for the first quarter. This industry is now negotiating with parts manufacturers for forgings, springs and other parts for the first quarter, or longer, and is endeavoring to place these at as low prices as they were bought for the fourth quarter. Parts makers, on the other hand, are trying to get higher prices, as most of the steel products they use have advanced. Some of them are now negotiating with producers for steel. Several of the automobile builders have scheduled their plants for high production in January. The Nickel Plate Railroad is in the market for its 1926 rail requirements amounting to approximately 20,000 tons. The Standard Oil Co. of Indiana has placed 135 stills for the Midwest Refining Co., Casper, Wyo. These will require 2700 tons of plates and were divided among Western fabricators. Inquiry for structural material in the building field has improved. A portion of 60,000 tons, or more, required for the Cleveland Union Station project is expected to come out within the next few weeks.

Steel bars are very firm at 2c., Pittsburgh, but some of the mills that have been attempting to get 2.10c. for small lots have abandoned their efforts. The plate market is firmer. Most mills are holding to 1.90c., Pittsburgh, and considerable business has been taken for the first quarter for that delivery, although one mill has gone to 1.85c. on large lots for the first quarter. For current shipment 1.80c. is still being named by an Ohio fabricator. Most mills are holding to 2c. for structural material and it takes an attractive order to bring out as low as 1.90c.

Jobbers quote steel bars, 3.10c.; plates and structural shapes, 3.20c.; No. 28 black sheets, 3.95c.; No. 28 galvanized sheets, 5.10c.; No. 10 blue annealed sheets, 3.15c.; cold-rolled rounds and hexagons, 3.90c.; flats and squares, 4.40c.; hoops and bands, 3.85c.; No. 9 annealed wire, \$3 per 100 lb.; No. 9 galvanized wire, \$3.45 per 100 lb.; common wire nails, \$3 base per 100 lb.

Pig Iron.—The market continues very dull. Total sales by Cleveland interests during the week were approximately 5000 tons and little new inquiry is pending. No sales are reported in Cleveland and few in the northern Ohio territory, the largest being a 500-ton lot of foundry iron. There are a fair number of consumers who have not covered for first quarter, but who plan to buy iron as needed. This is particularly

true of the sections where the prevailing price is \$23, furnace. There is virtually no change in the price situation. In the Valley district \$20.50, furnace, is the prevailing price on foundry and malleable iron and with Cleveland producers still out of the market, this plus the freight is the ruling price for Cleveland delivery. One western Pennsylvania maker is holding to \$21, furnace, and is able to make sales at that price for nearby delivery and for Eastern shipment. For delivery in western Ohio, Michigan and eastern Indiana, the market is unchanged at \$23, furnace. November shipments from several furnaces exceeded those in October and stocks of iron in merchant furnace yards were further reduced during the month. Shipping orders are good, although some of the foundries are following their usual policy of holding up shipments because of the approaching inventory period. One Tennessee producer has advanced 1.75 to 2.25 per cent silicon foundry iron to \$21, base Birmingham.

Quotations below, except on basic and low phosphorus iron, are delivered Cleveland, and for local iron include a 50c. switching charge. Ohio silvery and Southern iron prices are based on a \$3.02 freight rate from Jackson and \$6.01 from Birmingham.

Basic, Valley furnace.....	\$20.00
N'th'n No. 2 fdy., sil. 1.75 to 2.25.....	22.26
Southern fdy., sil. 1.75 to 2.25.....	\$27.01 to 28.01
Malleable	22.26
Ohio silvery, 8 per cent.....	32.52
Standard low phos., Valley furnace	28.00 to 28.50

Semi-Finished Steel.—There is still considerable inquiry for first quarter contracts and producers predict a shortage in the supply for that delivery. A local producer is comfortably filled for the first quarter. One Valley mill during the week was offered 6500 tons of sheet bars which it could not accept. An Ohio mill is inquiring for 30,000 tons of sheet bars and small billets. Premium prices are still prevailing for material for direct shipment. One lot of 500 tons of 2-in. x 2-in. billets brought \$38.50, Cleveland, for delivery to a point having the same freight rate from Pittsburgh.

Iron Ore.—The amount of Lake Superior ore on Lake Erie docks Dec. 1 was 7,856,154 tons, as compared with 8,049,276 tons on the same day a year ago. The dock balance is less than on this date since 1907, reflecting the tendency of consumers to take more ore direct from vessels to their plants. This has been made possible by improved handling facilities and larger storage room at furnace yards. Ore receipts at Lake Erie ports for the season to Dec. 1 were 38,596,823 tons, and shipments for the same period were 27,096,773 tons.

Sheets.—Buying for first quarter continues in fair volume and many of the mills have accumulated a good backlog for that delivery. Some round lot orders were placed by Detroit automobile companies during the week. Prices are firm at the recent advance for the first quarter, but some of the mills are still taking business at a \$2 a ton concession for direct shipment.

Reinforcing Bars.—Demand is unusually light even for this period of the year. Makers apparently are making no attempt to get higher prices on rail steel bars, which are unchanged at 1.80c., Pittsburgh, for car lots.

Bolts, Nuts and Rivets.—Cleveland bolt and nut manufacturers, who last week announced a 10 per cent advance on stove bolts, were unable to maintain the price, as some of the manufacturers in other districts adopted, for the first quarter, the prices that have been prevailing. Consequently, Cleveland makers have restored the former stove bolt discounts. With this action, last quarter discounts are being quoted for the first quarter on all items. Makers are booking a good volume of first quarter contracts. With the approach of inventory time, orders show some falling off. Rivet business has improved. Local makers will name the first quarter price on large rivets about Dec. 15. It is expected that the present price of \$2.60, Cleveland, will be re-established. Small rivets now appear firm at 70 and 10 per cent off list for current shipment and for first quarter.

Coke.—Connellsville foundry coke has declined further, and is quoted at \$5 to \$6, ovens, for standard brands for prompt shipment. Sales are light. Ohio

by-product foundry coke is quoted at \$8.50, ovens, for December shipment. There is not much activity in by-product domestic coke. Northern Ohio producers quote this grade at \$7.50 to \$8, ovens.

Old Material.—The market is quiet and rather weak. Activity is confined to buying by dealers to fill existing orders and the supply of scrap is plentiful. Dealers are paying \$17.50 to \$18 for heavy melting steel and \$14.50 to \$15 for blast furnace scrap, delivered to consumers' works in Cleveland. Dealers are offering \$18.50 for heavy melting steel for delivery to Youngstown mills. As Cleveland mills have a great deal of scrap under contract they are not expected to come to market this year.

We quote dealers' prices f.o.b. Cleveland per gross ton:

Heavy melting steel.....	\$17.00 to \$17.50
Rails for rolling	16.75 to 17.00
Rails under 3 ft.	19.50 to 20.00
Low phosphorus melting	19.00 to 19.25
Cast iron borings	14.25 to 14.50
Machine shop turnings	13.25 to 13.75
Mixed borings and short turnings	14.25 to 14.50
Compressed sheet steel	15.50 to 16.00
Railroad wrought	14.50 to 15.00
Railroad malleable	20.50 to 21.00
Light bundled sheet stampings	12.50 to 12.75
Steel axle turnings	15.25 to 15.50
No. 1 cast	18.00 to 18.50
No. 1 busheling	14.25 to 14.50
Drop forge flashings	14.75 to 15.00
Railroad grate bars	13.75 to 14.00
Stove plate	13.75 to 14.00
Pipes and flues	11.50 to 12.00

RAILROAD EQUIPMENT

Orders and Inquiries Bulk Well for Both Cars and Locomotives

Orders for 2200 freight cars and inquiries for 2600, orders for 53 locomotives and inquiries for 59, and reports of large prospective car purchases for the Van Sweringen roads make the past week a good one in the railroad equipment field. The items include:

The Wabash has ordered 2000 automobile box cars, of which 1000 will be built by the American Car & Foundry Co., 700 by the Standard Steel Car Co. and 300 by the Streater Car Co. This road has also ordered 200 steel baggage cars from the American Car & Foundry Co.

It is reported that the Chesapeake & Ohio Railroad will soon issue an inquiry for 10,000 freight cars. Months ago it was the understanding that the Van Sweringen interests would cover the requirements of their roads with one inquiry for about 20,000 cars, but the latest unofficial word is that each road will buy its own cars. Other roads that are expected to come into the market soon are the Chicago & North Western, whose prospective requirements are 4000 cars, and the Chicago, Rock Island & Pacific, which may inquire for 2000.

The Mobile & Ohio is in the market for 500 automobile box cars and 10 passenger cars.

The Union Pacific has authorized the purchase of 1000 automobile box cars, 1000 ballast cars and 100 tank cars. It will also buy 47 passenger cars.

The Norfolk & Western has placed an order for 43 steel passenger cars with the Bethlehem Steel Corporation.

The Florida East Coast is in the market for 50 locomotives.

The National Tube Co. has ordered 50 hopper car bodies from the Greenville Steel Car Co.

The Pittsburgh & West Virginia is inquiring for 700 50-ton gondolas and 300 composite gondolas, as reported last week.

The Seaboard Air Line has contracted for 50 locomotives with the Baldwin Locomotive Works.

The Southern Railway is asking prices on 5 2-8-2 type and 4 4-6-2 type locomotives for the Mobile & Ohio.

The Detroit Terminal Railroad has ordered 3 switching locomotives from the Baldwin Locomotive Works.

The Erie Railroad has placed 50 suburban cars and 18 coaches with the Standard Steel Car Co.

Pipe line pumping engines to the number of 24 will be installed by the Wilson-Snyder Mfg. Co., Pittsburgh, in eight pumping stations which the Crusader Pipe Line Co. of Arkansas will build in connection with a new oil pipe line now being laid from the Smackover Field near Eldorado, Ark., to the Mississippi River, near Monroe, La., a distance of approximately 150 miles.

NOVEMBER STEEL OUTPUT

Increase Over October 12,108 Tons Per Day or 8.4 Per Cent

A large increase in the steel ingot output of the country was again registered in November. At 156,294 gross tons per day the November output was 12,108 tons per day larger than that of October—an increase of 8.4 per cent. This compares with an increase in October over September of 7.3 per cent and in September over August of about 2 per cent. The August increase over July was practically 11 per cent. The November daily rate is the third largest this year, being just under the daily rate in February of 156,510 tons.

The statistics of the American Iron and Steel Institute show that the November output of the companies which made 94.43 per cent of the country's total in 1924 was 3,689,713 tons. Assuming that the 5.57 per cent not reporting produced at the same rate, a total October production is indicated of 3,907,353 tons. The corresponding annual rate is over 48,500,000 tons, or nearly 90 per cent of capacity.

If the December output approximates that of November, the total ingot production for 1925 will exceed 44,100,000 tons, or nearly 500,000 tons in excess of the best previous record.

The table gives the production by months of the different kinds of steel, together with the estimated daily rate for all companies.

Monthly Production of Steel Ingots, Reported by Companies Which Made 94.43 Per Cent of the Steel Ingot Production in 1924

(Gross Tons)				Calculated Monthly Production All Companies	Approximate Daily Production All Companies
Months 1925	Open-hearth	Bessemer	All Other		
Jan.	3,262,748	689,996	11,960	4,198,564	155,502
Feb.	2,931,964	602,042	13,014	3,756,243	156,510
March	3,336,169	614,860	13,633	4,198,520	161,482
April	2,857,802	515,715	14,182	3,587,524	137,982
May	2,754,130	497,708	13,790	3,458,253	133,010
June	2,538,988	476,945	12,490	3,207,056	123,348
July	2,444,969	457,095	13,547	3,087,590	118,753
Aug.	2,696,667	523,734	12,914	3,424,034	131,694
Sept.	2,737,251	547,121	13,977	3,492,904	134,342
Oct.	3,075,995	584,567	15,624*	3,893,028*	144,186*
Nov.	3,091,281	581,347	17,085	3,907,353	156,294
11 mo.	31,727,964	6,091,130	152,216	40,211,069	141,091
*Revised.					
1924					
Jan.	2,766,534	667,032	12,577	3,649,913	135,182
Feb.	2,902,641	695,905	14,085	3,826,246	153,050
March	3,249,783	706,801	15,260	4,206,699	161,796
April	2,575,788	573,381	12,356	3,448,466	128,787
May	2,060,896	425,099	6,648	2,640,034	97,779
June	1,637,660	310,070	2,622	2,065,676	82,627
July	1,525,912	241,880	5,162	1,877,789	72,223
Aug.	2,042,820	361,781	5,764	2,552,891	98,188
Sept.	2,252,976	409,922	6,864	2,827,625	108,755
Oct.	2,505,403	438,468	7,058	3,125,418	115,756
Nov.	2,479,147	459,349	8,403	3,121,149	124,846
11 mo.	25,999,560	5,289,688	96,799	33,241,906	116,230
Dec.	2,811,771	546,506	11,707	3,569,251	137,279
Total	28,811,331	5,836,194	108,506	36,811,157	117,984

Baltimore Hearings in Bethlehem Merger Case Concluded

BALTIMORE, Dec. 8.—Hearings in connection with the complaint of the Federal Trade Commission in the Bethlehem Steel Co. merger case were concluded here last Friday. It is planned to resume the hearings at Pittsburgh in the new year. About two weeks will be required to take testimony in Pittsburgh, according to present indications. After hearings are concluded there, they will be taken up in Washington, where also two weeks or more will be required. The hearings in Washington will consist largely of expert and statistical testimony and will complete the presentation of the side of the commission. After that the Bethlehem Steel Co. will submit rebuttal testimony. Next will come sur-rebuttal evidence by the commission, which will be followed by arguments and the conclusion of the case.

FABRICATED STEEL

Bookings Continue at Close to Weekly Average for the Year

With awards of nearly 33,000 tons and fresh inquiries appearing for 34,000 tons, the December rate of fabricated steel bookings for the larger size projects as reported to THE IRON AGE is fully up to the weekly average of 30,000 tons for the first four months of the year, though somewhat down from the 39,000-ton average for October and November. The weekly rate so far in 1925 is about 33,000 tons. Among late awards are the following:

Office building, Academy Street, Newark, N. J., 800 tons, to Hay Foundry & Iron Works.

Loft building at 16 East Fifty-third Street, New York, 200 tons, to Hay Foundry & Iron Works.

St. Raymond parish school, Lynbrook, Long Island, 225 tons, to Lehigh Structural Steel Co.

Apartment building, 534 West Fifty-sixth Street, New York, 900 tons, to Hinkle Iron Co.

Thompson Scenic Railway Co., Coney Island, New York, roller coaster, 600 tons, to Nelson & Landgren.

O. H. Berry & Co., department store, Richmond, Va., 350 tons, to Richmond Structural Steel Co.

Johns Hopkins University, Baltimore, dispensary building, 1200 tons, to Dietrich Brothers, Baltimore.

Atlantic Coast Line, two bridges in Florida, 250 tons, to McClintic-Marshall Co.

Breakers Hotel, West Palm Beach, Fla., 900 tons, to an unnamed fabricator.

New York Central Railroad, bridge repairs, 600 tons, to an unnamed fabricator.

New York-New Jersey vehicular tunnel viaduct on New Jersey side, 4400 tons, to American Bridge Co.

Mason Hotel, Jacksonville, Fla., 500 tons, to American Bridge Co.

Gettysburg College, Gettysburg, Pa., gymnasium, 300 tons, to an unnamed fabricator.

Highway bridge over Big Sandy River in Kentucky, 400 tons, to an unnamed fabricator.

A. W. Smith's department store, Spartansburg, S. C., 300 tons, to an unnamed fabricator.

Office building and restaurant, Sixteenth and Chestnut Streets, Philadelphia, 700 tons, to Robert B. Lederle & Co., Philadelphia.

Phoenix Utilities Co., New York City, 750,000 cu. ft. gas holder at Lakeland, Fla., 600 tons, to Stacey Mfg. Co., Cincinnati.

Louisville & Nashville Railroad, bridges, 2100 tons, to American Bridge Co.

Detroit Edison Co., Detroit, Trenton Channel plant, 3100 tons, to Jones & Laughlin Steel Corporation.

Piety Street dock shed, New Orleans, 250 tons, to Stupp Brothers Iron & Steel Co., St. Louis.

Morton Building, Wells and Washington Streets, Chicago, 4200 tons, to American Bridge Co.

Garden Court apartments, North Michigan Avenue, Chicago, 2500 tons, to American Bridge Co.

Minneapolis, St. Paul & Ste. Marie Railway Co., bascule span, Manitowoc, Wis., 250 tons, to American Bridge Co.

Louisville Hydroelectric Co., Louisville, railroad swing bridge, 540 tons, to Louisville Bridge Co.

Union Electric Light & Power Co., St. Louis, remodeling office building, 360 tons, to Mississippi Valley Structural Steel Co.

Bridge, Main Street, Ottawa, Kan., 300 tons, to Bethlehem Steel Co.

Rochelle Canneries, Inc., De Kalb, Ill., 150 tons, to Mississippi Valley Structural Steel Co.

Canal Street Theater, New Orleans, 975 tons, to Virginia Bridge & Iron Co.

Armour & Co., Chicago, smoke house, 250 tons, to Hansell Elcock Co., Chicago.

Inland Steel Co., Indiana Harbor, crane runway, 300 tons, to Wisconsin Bridge & Iron Co., Milwaukee.

St. Francis Hospital, San Francisco, addition, 250 tons, to Central Iron Works, San Francisco.

California Portland Cement Co., Colton, Cal., 300 tons, to McClintic-Marshall Co.

Goodyear Tire & Rubber Co., Los Angeles, 100 tons, to Minneapolis Steel & Machinery Co.

Inspiration Copper Co., Miami, Ariz., 400 tons, to Union Iron Works, Los Angeles.

Steel barge for export to unnamed firm in Hawaii, 200 tons, to Pacific Coast Engineering Co., Oakland, Cal.

Elks' Club, Santa Barbara, Cal., 400 tons, to Union Iron Works.

Chrysler Motor Corporation, Detroit, 900 tons, to Fort Pitt Bridge Works.

Barker Brothers Co., Salem, Mass., 100 tons, to Fitchburg Bridge & Iron Works, Fitchburg, Mass.

Broadway junior high school, Toledo, Ohio, 400 tons, to American Bridge Co.

Wilson Building, Camden, N. J., 600 tons, to Pittsburgh Bridge & Iron Co.

Aluminum Co. of America, Cleveland, plant extension, 850 tons, to McClintic-Marshall Co.

Bascule lift bridge, Chicago, 800 tons carbon steel and 300 tons of alloy steel, to Mount Vernon Bridge Co., Mount Vernon, Ohio.

Goodyear Tire & Rubber Co., Akron, Ohio, factory, 500 tons, to Burger Iron Works Co., Akron.

Structural Projects Pending

Inquiries for fabricated steel work include the following:

Harper Organization, office building, Lafayette Street, New York, 2500 tons.

H. R. H. Construction Co., loft building, Eighth Avenue and Thirty-sixth Street, New York, 3000 tons.

Mount Sinai Nurses' Home, Fifth Avenue and Ninety-eighth Street, New York, 1500 tons.

Loft building, West Twenty-eighth Street, New York, 700 tons.

Kolb Baking Co., Albany, N. Y., 300 tons.

Pennsylvania Railroad, bridge near Altoona, Pa., 300 tons.

New York Central, four bridges at Erie, Pa., 2000 tons.

Flynn & Embrich Co., Baltimore, foundry building, 400 tons.

New York Curb Market, addition, 400 tons.

National Science Building, Buffalo, 800 tons, general contract placed with the Felton Construction Co.

New York-New Jersey vehicular tunnel, ventilating buildings and shafts, 2400 tons.

Apartment hotel, Park Avenue and Fifty-sixth Street, New York, 2000 tons.

Rhode Island College of Education, Providence, R. I., 100 tons.

Louisville & Nashville Railroad, turntable, 100 tons; bids close Dec. 21.

Maccabee Lodge, Detroit, 1120 tons.

Union Pacific Railroad, double track bridges in Utah, 1500 tons.

Saenger Theater, Havana, Cuba, 900 tons.

Masonic Temple, Cincinnati, 3000 tons.

Louisiana Railway & Navigation Co., Shreveport, La., bridge, 1700 tons.

Saenger Theater, Atlanta, Ga., 1000 tons.

Elmhurst School, Oakland, Cal., 117 tons.

Crocket School, Crocket, Cal., 200 tons.

Californian-Hawaiian Sugar Co., Honolulu, H. I., and San Francisco, 750 tons.

Golden State Theater Corporation, San Francisco, 116 tons.

Theater for E. L. Doheny and associates, Eleventh and Hill Streets, Los Angeles, 1100 tons.

Lacy Apartments, San Francisco, 207 tons.

Western Pacific Railroad Co., San Francisco, 1000 tons.

Synagogue, Los Angeles, 600 tons.

Willys-Overland Co., Toledo, forge shop, 500 tons.

Philadelphia Rubber Co., 9 small factory buildings near Philadelphia, about 1000 tons.

St. Charles of Boremeo School, Philadelphia, 1500 tons.

Worth Steel Co., Claymont, Del., mill building, 800 tons.

Nurses' Home, Philadelphia, 400 tons.

Norfolk & Western Defends Proposed Rates from Southern Ohio Furnaces

WASHINGTON, Dec. 8.—Forced by the time element, the Norfolk & Western Railway telegraphed today, through its general freight agent, G. F. Butler, to the Interstate Commerce Commission, replying to the protest of the Louisville & Nashville Railroad against the proposed reduced rates in pig iron, effective next Tuesday from southern Ohio to Kentucky and Indiana points. In his telegram, Mr. Butler stated that blast furnaces in southern Ohio actually owned or chartered barges for the transportation of their product. This was cited to show that competition is keen.

The river rate of \$2.48 per gross ton was declared to be a maximum river charge based on the cost to the shipper who had not yet installed modern loading equipment. This made the \$2.65 rate proposed by the Norfolk & Western and Chesapeake & Ohio necessary to obtain business. Mr. Butler asserted that the Louisville & Nashville petition compared rates from southern Ohio to Cincinnati, but overlooked the Chesapeake & Ohio rate of \$1.89 from Ashland to Newport, Ky., which made the proposed rate from southern Ohio furnaces to Louisville 76c. higher than the rail rate to Newport. This rate was declared to be necessary to meet river competition.

NON-FERROUS METALS

The Week's Prices

Cents per Pound for Early Delivery

Dec.	Copper, New York		Straits Tin (Spot)	Lead		Zinc	
	Lake	Electro-lytic*		New York	St. Louis	New York	St. Louis
2.....	14.25	13.87½	63.25	9.50	9.25	8.80	8.45
3.....	14.25	13.75	63.10	9.50	9.25	8.87½	8.52½
4.....	14.25	13.75	64.00	9.50	9.25	8.95	8.60
5.....	14.25	13.75	....	9.50	9.25	8.95	8.60
7.....	14.25	13.75	63.50	9.50	9.25	9.05	8.70
8.....	14.25	13.87½	63.50	9.25	9.00	9.10	8.75

*Refinery quotation; delivered price ¼c. higher.

New York

NEW YORK, Dec. 8.

The markets are all quiet. Copper has continued to decline. Tin has changed but little in an inactive market. Lead has eased further. Prices for zinc have again turned higher.

Copper.—Electrolytic copper has again gone to lower levels in the third week of declining prices. It has fallen of its own weight, there being no support in domestic or foreign buying. More interest is being shown by exporters but very little business has yet resulted. Absence of buying by Europe continues to be the main cause of weakness in the market. Domestic consumers are buying only on price recessions and at their own decided advantage. They are covered for December and part of January. Sellers expect considerable buying for January and February consumption. Late last week the price fell to 14c., delivered, but it is believed that today there is little, if any, metal left at this price. Most producers are quoting 14.12½c., delivered, but there have been one or two sales as low as 14.10c. We quote the market at 14.12½c., delivered. Lake copper is quoted at 14.25c., delivered.

Tin.—There has been but one active day during the week covered by this report. On Dec. 3 250 tons changed hands, but all the other days up to today have been almost stagnant with practically no sales made. Today the market has been a little more active with spot Straits tin quoted 63.50c., New York. Spot tin is scarce and available only in five and 10-ton lots. There is a premium also on December delivery, the drop in premium having begun with January delivery. Prices on London today were £286 17s. 6d. for spot standard, £280 5s. for future standard and £290 7s. 6d. for spot Straits. The Singapore price yesterday was £287 15s. The only other feature of the market is the interesting battle in London between two large interests. One is selling tin freely and the other is buying freely what he sells. The buyer has been a bull on the market for a long time. No definite opinion as to the outcome of this strife is available in this market. Arrivals thus far this month have been 1730 tons with 6493 tons reported afloat.

Lead.—Early today the leading interest changed its New York contract from 9.50c. to 9.25c., New York. This is the second reduction in many weeks. The outside market is also lower at 9c. to 9.25c. St. Louis, or 9.35c. to 9.50c., New York. Demand is light with general conditions unchanged.

Zinc.—The market for prime Western zinc has steadily grown stronger and is considerably higher than a week ago. There is a scarcity of prompt and December metal and a significant fact is a desire on the part of consumers to have metal shipped as early as possible. The domestic situation is a strong one, there being little demand for export because of the low prices on the other side. The statistics for November are awaited with keen interest because of the low stocks revealed a month ago. Prime Western zinc is quoted at 8.75c. to 8.80c., for December, or 30-day shipment, with prompt held at 8.80c., St. Louis. The New York price is 9.10c. for early shipment.

Nickel.—Wholesale lots of ingot nickel are quoted

unchanged at 34c., with shot nickel at 35c. and electrolytic nickel at 38c.

Antimony.—There is no let-up in the strength or scarcity of Chinese metal. For spot delivery 20.25c., New York duty paid, is obtained, with January arrival at 20c. and February at 19.75c.

Aluminum.—Virgin metal, 98 to 99 per cent pure, is quoted at 28c., delivered.

Old Metals.—Dealer's selling prices, which are generally lower, are, in cents per lb., as follows:

Copper, heavy and crucible	13.50
Copper, heavy and wire	12.75
Copper, light and bottoms	11.50
Heavy machine composition	10.00
Brass, heavy	9.00
Brass, light	7.75
No. 1 red brass or composition turnings ..	9.25
No. 1 yellow rod brass turnings	9.50
Lead, heavy	8.50
Lead, tea	7.00
Zinc	5.75
Cast aluminum	22.00
Sheet aluminum	22.00

Chicago

DEC. 8.—Copper is somewhat lower in an easy market. Tin has advanced in a strong market and zinc is unchanged. Antimony has stiffened up under the influence of a better demand and lead has followed the downward movement of the foreign market. Used metals are unchanged in a quiet market. We quote in carload lots: Lake copper, 14.25c.; tin, 64.75c.; lead, 9.50c.; zinc, 8.85c.; in less than carload lots, antimony, 22c. On old metals we quote copper wire, crucible shapes and copper clips, 11.25c.; copper bottoms, 9.75c.; red brass, 9c.; yellow brass, 8c.; lead pipe, 8.25c.; zinc, 5.25c.; pewter, No. 1, 37c.; tin foil, 44c.; block tin, 52c.; all being dealers' buying prices for less than carload lots.

Non-Ferrous Rolled Products

Mill prices on non-ferrous rolled products remain unchanged from a week ago, but in view of a decline in ingot copper a downward revision of quotations on brass and copper products is an early possibility. For New York warehouse prices, see page 1656.

List Prices Per Lb., F.O.B. Mill

On Copper and Brass Products Freight Up to 75c. Per 100 Lb. Allowed on Shipments of 500 Lb. or Over

Sheets	
High brass	19½c.
Copper, hot rolled	22¼c.
Zinc	12c.
Lead (full sheets)	13½c.
Seamless Tubes	
High brass	24c.
Copper	24¼c.
Rods	
High brass	17¼c.
Naval brass	19½c.
Wire	
Copper	16½c.
High brass	19½c.
Copper in Rolls	21¼c.
Brass Tubing	27½c.

Steel Corporation Mississippi Terminal

An Associated Press dispatch of Dec. 2, with New York date, refers to the acquisition of a tract of land at Port Allen, La., by the Carnegie Steel Co. for use in connection with the shipment of steel products by barge down the Mississippi River. The report is simply an incorrect version of an announcement made in THE IRON AGE of July 30, page 278. The fact is, as there stated, that the Carnegie Steel Co. has bought 20 acres in the Baton Rouge district (Port Allen being opposite Baton Rouge) to provide facilities for unloading from barges steel products that will be distributed by rail in the Southwest. Construction of the Port Allen terminal waits on the completion of locks the Government is building in the lower Ohio River.

To Retain Susquehanna Agency

Rogers, Brown & Crocker Brothers, Inc., New York, will retain the national agency in the coming year for the sale of Susquehanna pig iron produced by the Rogers-Brown Iron Co., Buffalo.

PERSONAL

William H. Woodin, president American Car & Foundry Co., 165 Broadway, New York, was elected president of the American Locomotive Co., New York, at a meeting of the board of directors of the latter company on Dec. 3. He succeeds the late Andrew Fletcher, who was a director of the American Car & Foundry Co., and with whom Mr. Woodin had been associated for many years. Mr. Woodin is one of the largest owners of the stock of the American Locomotive Co. It was stated at the offices of both companies that his election to the presidency of the locomotive company, while retaining the position of chief executive of the car company, will mean a closer relationship, but no actual merger of the two companies. Mr. Woodin, who is 57



WILLIAM H. WOODIN

years old, joined the American Car & Foundry Co. when it was organized in 1899. He is a descendant of a family of foundrymen. His grandfather founded the Jackson & Woodin Mfg. Co. at Berwick, Pa., in 1835 and his father followed next in that company. Mr. Woodin began his work with practical experience in the shops and his son is now following his example. In 1892 Mr. Woodin was general superintendent of his father's plant, became vice-president in 1895 and president in 1899, when he joined the American Car & Foundry Co., which was then being organized. He is a director of numerous companies, including the Canadian Car & Foundry Co., Cuba Railroad Co., General Motors Corporation, Montreal Locomotive Works, Westinghouse Electric & Mfg. Co. and the Westinghouse Electric International Co.

C. E. Phillips has been appointed representative in charge of the Wilkes-Barre office of the Allis-Chalmers Mfg. Co., Milwaukee. Mr. Phillips, who was formerly connected with the Philadelphia office of the company, succeeds Guy V. Woody.

David Ayr has been appointed factory manager for the Pratt & Whitney Co., Hartford, Conn.

Frank O. Hoagland has resigned from the Saco-Lowell shops and returned to the Pratt & Whitney works (Hartford, Conn.) of the Niles-Bement-Pond Co., as master mechanic in charge of engineering in the combined machinery and small tool departments, reporting directly to Vice-president C. R. Burt.

D. W. Hughes, for the past year secretary Elevator Supplies Co., Hoboken, N. J., was recently elected secretary and treasurer, succeeding in the office of treasurer the late Charles Henry Herman, who died Nov. 1. Mr. Hughes, who is 31 years of age, is a graduate of the University of Pennsylvania. He entered the service of the Elevator Supplies Co. in 1923 as assistant to the vice-president and was elected secretary in April, 1924.

L. A. Schmidt has been appointed consulting engineer and assistant general manager of the Locomobile Co. of America, Bridgeport, Conn. He was for several years chief engineer of the Fiat company in this country, and his training in the Turin (Italy) plant was of the most exacting nature. His shop experience has been equally extensive.

H. C. Haight, who has been treasurer and general manager of the American Forge & Machine Co., Canton, Ohio, since 1909, has been elected president. H. L. Barnes, who recently joined the company, was made secretary and general manager.

M. B. Crider, purchasing agent Niles Tool Works Co., Hamilton, Ohio, has resigned to accept a similar position with the Champion Coated Paper Co., Hamilton. He had been associated with the former company for 29 years.

John R. Foster, vice-president in charge of pig iron and steel sales, David J. Joseph Co., Cincinnati, has resigned.

Jean Boyau has been appointed resident engineer of the Compagnie Francaise Thomson-Houston, with offices in the International General Electric Co. at Schenectady, N. Y., succeeding Jean Canivet, who was drowned July 10. Mr. Boyau studied at the Lycée Carnot in Paris. He was awarded the Croix de Guerre and made Chevalier de la Légion d'Honneur, for war service. He came to the United States in May of this year as assistant to Mr. Canivet.

Owen D. Young, chairman of the board, General Electric Co., New York, has been elected a Class B director of the Federal Reserve Bank of New York for a term of three years, ending Jan. 1, 1929.

George Cotton, until recently superintendent of shops at the Kewanee, Ill., works of the Walworth Co., 82 Pearl Street, Boston, has been promoted, effective Dec. 1, to the superintendency of that company's Kelley-Jones plant at Greensburg, Pa.

Eugene F. Spangler, assistant agent Standard Steel & Bearings, Inc., Plainville, Conn., has resigned to accept a position in Philadelphia.

H. C. Beebe, for the past 14 years connected with the sales department of the Johns-Manville Co., Cleveland territory, has resigned, to become distribution sales manager for the Henry Furnace & Foundry Co., East Forty-ninth Street, Cleveland.

Despite the infirmities of age, Joseph G. Butler, Jr., Youngstown, veteran steel maker of the Mahoning Valley, is proceeding with plans for the expansion of the art gallery which he donated several years ago to the community and which is rapidly becoming a cultural center for northeastern Ohio. Mr. Butler is constantly under a physician's care, but in spite of this usually motors every afternoon for a short distance.

E. J. Wagner, formerly secretary and general manager Standard Gauge Steel Co., Beaver Falls, Pa., absorbed by the Union Drawn Steel Co. early this year, is head of the Standard Steel Specialty Co., which has purchased from the Union Drawn Steel Co. its business in machine and Woodruff keys, machine racks, taper pins, connecting rods and machined sections, as well as the equipment for making these products. The company plans the erection of a new plant early next year and in the meantime is using space in an existing plant at First Avenue and Eleventh Street, Beaver Falls.

K. D. McKoll, Forest, Ontario, Canada, will represent the United States Electrical Tool Co. as its Canadian district manager, with office in Toronto.

A. L. Feild, who has been a member of the technical staff of the Union Carbide & Carbon Corporation for a number of years, first at the Cleveland works of the National Carbon Co., then at the Niagara Falls plant of the Electro Metallurgical Co., and more recently at the Union Carbide & Carbon Research Laboratories, Inc., Long Island City, has resigned to join the metallurgical staff of the United Alloy Steel Corporation, Canton, Ohio. Mr. Feild, prior to his connection with the Union

Carbide & Carbon Corporation, was assistant metallurgist in the Bureau of Mines (1914-1917). Here he carried on experimental measurements on the viscosity of blast furnace slags at high temperatures in recognition of which he was made first recipient of the J. E. Johnson, Jr., Award by the American Institute of Mining and Metallurgical Engineers. Mr. Feild is probably best known, however, for his experimental work on the application of zirconium ferroalloys to steel manufacture and for his physicochemical treatment of the open-hearth process. Since 1923 he has been an active member of the iron and steel committee of the A. I. M. and M. E. In his new position with the United Alloy Steel Corporation Mr. Feild will carry on experimental, development and control work in connection with the physical chemistry of steel.

J. S. Adelson, an alumnus of Case School of Applied Science, has been appointed chief metallurgist by the Elyria Iron & Steel Co., Cleveland.

Jonathan Warner, formerly president of the Trumbull Steel Co., Warren, Ohio, is now residing in New York, where he is under a physician's care.

Robert Adler, for the past 12 years connected with the Truscon Steel Co., Youngstown, Ohio, the last seven years as manager of the Minneapolis district, has resigned, effective Dec. 15. For the present he will devote his time to personal interests and will announce a new connection later.

Newton D. Baker, secretary of war in the Wilson administration, has been appointed general counsel of the Lake Carriers' Association, with headquarters at Cleveland, succeeding Harvey D. Goulder, resigned. After serving as a cabinet officer during the war, Mr. Baker returned to Cleveland and resumed his law practice.

J. W. Bolton, metallurgist Niles Tool Works, Hamilton, Ohio, of the Niles-Bement-Pond Co., has resigned and accepted a position as metallurgist with the Frank Foundries Corporation, Moline, Ill. He will assume his new duties Jan. 2. Mr. Bolton has been doing research work for the Niles company for a number of years and has contributed several articles to technical societies and to the technical press on foundry subjects.

Major Earle W. Buckingham, engineer of standards with the Pratt & Whitney Co., Hartford, since 1919, has joined the professorial staff of the Massachusetts Institute of Technology, Cambridge, Mass., in the industrial engineering department.

E. J. Lowry, metallurgist for Hickman-Williams & Co., will be the speaker at the next meeting of the Quad City Foundrymen's Association, which will be held at the Le Claire Hotel, Moline, Ill., Monday evening, Dec. 14. His subject will be "Pig Iron in Relation to Cupola Cast Iron." The talk will be illustrated by lantern slides showing blast furnace materials and their reactions in the cupola product. There will be a discussion of scrap in blast furnace mixtures.

Herbert J. Watt, for eight years in the Washington office of the United States Steel Corporation, who recently resigned to become affiliated with the Jones & Laughlin Steel Corporation, Pittsburgh, has assumed his new position in the Pittsburgh city sales department of that company.

John S. Oursler, general superintendent Homestead works, Carnegie Steel Co., Pittsburgh, has been elected a director of the company to fill the vacancy created by the resignation of H. D. Williams.

To Scrap Pullman Mill

Briggs & Turivas, 110 South Dearborn Street, Chicago, have purchased and will scrap the old Pullman Co. rolling mill, Pullman, Ill. The capacity of this mill was 15,000 tons of scrap bars and 60,000 tons of merchant bars per year.

Tinius Olsen Celebrates Eightieth Anniversary

PHILADELPHIA, Dec. 8.—In celebration of the eightieth birthday anniversary of Tinius Olsen, founder and head of the Tinius Olsen Testing Machine



TINIUS OLSEN

Co., Philadelphia, a reception was held at the home of his son, T. Y. Olsen, at Mount Airy, Philadelphia, Dec. 7. A throng of friends, business associates and employees congratulated Mr. Olsen. Among the guests was Samuel M. Vauclain, Baldwin Locomotive Works, who has been a friend for 44 years. Mr. Olsen, hale and hearty, received his well wishers with a smiling face and hearty clasp of the hand.

Wearing the star of the Order of St. Olaf, he made a distinguished appearance. In recognition of the aid he has given to his mother country, and particularly to his native city, Kongsberg, Norway, the king of that country made Mr. Olsen a knight of the Order of St. Olaf in 1907, and this past summer he was made a commander of the order.

Mr. Olsen's anniversary was of international import, for on the evening of the reception a celebration was held in his honor in the Grand Hotel of Kongsberg. Several cablegrams of congratulations were received from Norway, these having been sent by various technical societies, including the Horton Technical School and the Technical Association of Norway. One of Mr. Olsen's benefactions was the donation of several hundred thousand kroner for the endowment of an evening engineering school for poor boys. He also defrayed the expense of collating and publication of a leather-bound catalog of the engineering literature in Norway, Sweden, Denmark and Finland.

Among the gifts received by Mr. Olsen was a medalion in gold on which was a splendid likeness of Mr. Olsen in relief. This was given by his employees, many of whom have been with him for years. From Norway he received a bound volume giving the history of his life and achievements. It was a book of 51 pages, with illustrations, and paid tribute to him. From the Trinity Norwegian Lutheran Church he received an engrossed and framed expression of the esteem in which he is held. This was in poetical form. At the reception Norwegian music was rendered by an orchestra and a Scandinavian glee club. The walls of the reception room displayed certificates of award of merit given to Mr. Olsen at expositions where his testing machines have been exhibited. Displayed also was a model of one of these machines.

Temple Furnace in Receivership

A receiver in equity has been appointed for the Temple Furnace Co., Temple, Pa., by Judge Dickinson in the United States District Court in Philadelphia. Paul Brooks, sales manager for the Debevoise-Anderson Co., in Philadelphia, was appointed receiver. The Debevoise-Anderson Co. has been selling agent in the New York and Philadelphia territories for Temple iron, and Nils Anderson of this company is a holder of \$75,000 worth of the Temple company's preferred stock. Creditors and stockholders agreed to the receivership in an effort to put the business of the company on a better basis. Assets were reported to exceed liabilities by about \$100,000, but there was not enough liquid capital to meet obligations. The furnace has been out of blast for about a year and no plans have yet been made for resumption, but this will probably be done under the receivership if market conditions seem to justify it.

OBITUARY

W. G. TALBOT, manager since 1917 of the southern branch of the Western Pipe & Steel Co. of California, died at Los Angeles, Dec. 3. He had been identified with the company since 1906, and was a brother of J. A. Talbot, one of the present vice-presidents of the company. He was born in Kentucky 48 years ago.

WILLIAM C. COLLINS, at one time an official of the Keystone Steel & Wire Co., Peoria, Ill., died at his home in Chicago, Nov. 26.

FRANK J. MCGRATH, general superintendent Sweet's Steel Co., Williamsport, Pa., died at his home on Dec. 2. He had been ill two weeks but his death was sudden and unexpected. Mr. McGrath was born at Scranton 46 years ago. He had been connected with the Sweet's company about twelve years.

FRED B. CROSBY, a former official of the Toledo Metal Wheel Co., Toledo, Ohio, died at his home in Evanston, Ill., Dec. 5.

LEWIS JOHNSON, manager of the cold-rolled strip and flat wire department of the American Steel & Wire Co., Chicago, died Dec. 6, following an operation. He was born in Chicago in 1879, and there received a common school education. He started work at the age of 13 for the Washburn & Moen Mfg. Co., at the Lake Street warehouse, Chicago. He gradually advanced until he was appointed department manager, a position he has held for the past 10 years. He is survived by Mrs. Johnson and three sons. He was a member of the Illinois Athletic Club, and at the October convention of the National Association of Farm Equipment Manufacturers he was elected president of the auxiliary association.

GEORGE F. OTT, 84 years old, one of the pioneer boiler manufacturers of the East, died at his home in Philadelphia, Sunday, Dec. 6. He was head of the George F. Ott Co., which for nearly half a century has specialized in the manufacture of copper and iron boiler work, principally for breweries.

JOHN W. BRAGGER, aged 65, inventor of many mechanical appliances, died at his home in Watertown, N. Y., on Nov. 22, following a lingering illness. He began his business career with J. B. Taylor, Watertown, which was later consolidated with the J. B. Wise Co., and he became superintendent of the Taylor plant. In 1908, in Denver, Colo., he organized the Western Welding Co. In 1911 he returned to Watertown and became mechanical and consulting engineer for the J. B. Wise Co., and has completed many inventions which proved successful. In 1899 he devised a machine which made a complete hinge from raw material.

To Make Steel Pipe Couplings

The Wheeling Machine Products Co., Twentieth and Main Streets, Wheeling, W. Va., has purchased from the city of Wheeling its old water works on the river road in a section of the city known as Slacktown. The city council recently voted to accept the company's bid of \$25,000 for the property, which is to be turned over by May 1, 1926. E. W. Krause, treasurer and general manager, announces continuance at the company's present location of its manufacturing, machine and mill, mine and factory supply departments and that the acquired buildings, following changes, repairs and the installation of new equipment will be used in the production of steel pipe couplings.

The tenth annual meeting of the American Gear Manufacturers Association will be held at the Book-Cadillac Hotel, Detroit, May 13, 14 and 15, 1926.

Youngstown Reinforcing Bar Plants Curtail

YOUNGSTOWN, Dec. 8.—Reinforcing steel fabricators are experiencing a seasonal decline in demand and are operating at reduced rates. President Julius Kahn states the Truscon Steel Co. is averaging 70 per cent, its production being cut down by reason of reduced business in fireproofing, building materials and highway reinforcing products. During the past week the company broke ground for extensions to its plant on Albert street, designed to increase its capacity for producing steel fireproofing products. The Kalman Steel Co. is operating its Youngstown plant at 25 per cent.

Car builders and car repair interests in the Mahoning Valley are operating at a rate close to normal. Pressed metal plants catering to the automobile trade are experiencing a seasonal letdown in orders, owing to the approaching inventory period.

Reinforcing Steel

Projects Awarded

Paradise Theater, Crawford Avenue and Park Street, Chicago, 100 tons to the Concrete Engineering Co.
Missouri State road work, 400 tons to Olney J. Dean & Co.
Fairfax Hotel, Dorchester Street and Hyde Park Boulevard, Chicago, 250 tons of rail steel to Calumet Steel Co.
Goodyear Tire & Rubber Co., building, Fifty-eighth Street and Eleventh Avenue, New York, 200 tons to Concrete Steel Co.
Macy Co., warehouse, Long Island City, N. Y., 200 tons to Concrete Steel Co.
Motor Improvement Co., building, 100 tons to Concrete Steel Co.
Sears, Roebuck & Co., building, Newark, N. J., 100 tons to Igoe Brothers.
Lion Match Co., building, Long Island City, N. Y., 100 tons to Igoe Brothers.
Glasser Building, 4826 Sheridan Road, Chicago, 100 tons to the Barton Spiderweb System, Inc.
Apartment building, 937 Glenglye Place, Chicago, 100 tons to the Barton Spiderweb System, Inc.
New York subway work, Arthur McMullen Co., general contractor, 400 tons to McClintic-Marshall Co.
New York subway work, T. A. Gillespie Co., general contractor, 200 tons to McClintic-Marshall Co.
Municipal sewer, Philadelphia, Whiting-Turner Construction Co., general contractor, 500 tons to Kalman Steel Co.
Bridge, Fredericksburg, Va., 1400 tons to Kalman Steel Co.
Selby Shoe Co., Ironton, Ohio, 180 tons to Pollak Steel Co.

Projects Pending

Western Hills High School, Cincinnati, 200 tons; Garber & Woodward, Union Central Building, Cincinnati, architects; bids close Dec. 21.
Good Samaritan Hospital, Cincinnati, 200 tons.
Elks Building, Brooklyn, 175 tons.
Hendrey Hospital, Ridge Avenue, Evanston, Ill., 100 tons.
Charles B. Johnson, general contractor.
Morton Building, Washington and Wells Streets, Chicago, 350 tons, general contract awarded to Henry Ericsson.
Junior high school, Nordica, Sayer and Wellington Streets, Chicago, 300 tons.
Belmont Harbor Hotel, Chicago, 500 tons. Robert DeGolyer, architect.
Henry Apartments, Chicago, 500 tons. Chieldiar & Fugard, architects.
Commonwealth Edison Co., building at Twenty-second Street and Throop Avenue, Chicago, 200 tons.
Amakomy Building, Memphis, Tenn., 150 tons.
Brandon Road pool, Joliet, Ill., Illinois State Division of Waterways, 1000 tons.
Starved Rock Lock and Dam, Illinois State Division of Waterways, 400 tons. Hooper & Janish, architects.
Breakers Hotel, West Palm Beach, Fla., Florida East Coast Railway, 800 to 1000 tons, to Turner Construction Co., general contractor.

An international exhibition for inland navigation and utilization of hydraulic power is to be held from July to September, at Basle, Switzerland. A world power conference is scheduled to conduct sessions at some time during the course of the exposition. Information may be obtained from the Swiss Consulate, 104 Fifth Avenue, New York, or the Agency of the Swiss Federal Railroads, 241 Fifth Avenue, New York.

Some Fundamental Relationships

(Continued from page 1603)

oxide is covered by a thin film of earthy oxides only 0.1 mm. thick. The reduced iron grain is later covered by a film of slag-forming oxides 0.18 mm. thick. It is of course impossible to assume that such homogeneity of structure exists in the ore mass, but these means of visualization of the disposition of the iron grains amid the earthy gangue are helpful to the critical student.

In Table I it will be noted that about four times as much volume of hot gases sweeps past each cubic foot of ore in Furnace 2 as in Furnace 1. Hence the gas effect must be considerably more potent when in contact with the thin covered iron grain in Furnace 2 than in the case of the thicker covered grain in Furnace 1.

Preheating of the ore and reduced iron during its descent from the stock line to the fusion zone, level of maximum combustion rate, must be greatest in Fur-

Table II

	No. 1 Furnace	No. 2 Furnace
Thickness of slag-forming oxides covering 1 mm. cube nucleus of iron oxide.....	0.25 mm.	0.10 mm.
Thickness of gas film enveloping the ore grain.....	0.20 mm.	0.15 mm.
Thickness of slag-forming oxides covering 1 mm. cube nucleus of reduced iron....	0.42 mm.	0.18 mm.
Thickness of gas film enveloping the gangue-covered iron grain	0.24 mm.	0.17 mm.

nace 2, where the escaping throat-gases are 600 deg. Cent. This means that iron reduction takes place higher in the furnace stack in No. 2 than in No. 1. It also follows that the carburization of the iron grains proceeds more rapidly in Furnace 2 because of the more ample gas supply, the grains coming into contact with richer gas at higher temperatures than in Furnace No. 1. The resulting iron will therefore be higher in total carbon content in No. 2 than in No. 1 for, in addition to the richer and hotter gas supply and accompanying higher preheating effect, the burden takes longer to pass through the furnace in No. 2 than in No. 1.

If the ore is rich in iron content and is readily reduced then, if the hot gases produced by burning an excess of carbon per unit area at the level of maximum combustion, per hour, raise the temperature of the preheating zone above that level, the fusion level will be raised.

This melting level, fixed by the proportion of coke to iron in the burden, will vary with the reducibility of the ores or other iron-yielding ingredient in the burden. Thus hematite ore and furnace cinder may contain equal percentages of iron, but the first will require less coke per ton of iron yield and the rates of smelting in the same furnace will differ. The hematite ore will be reduced at a higher level than the flue cinder which, as a slag, melts before its iron content is reduced; hence the iron reduced from the cinder is not so highly carburized as that from the hematite. Similarly the iron reduced from a lean ore may descend low into the furnace before it is reduced, carburized and fused, a low-carbon iron being the result.

Again, in the same furnace the ratio of coke to ore burden may be greatly different, while working the same ore. By different rates of driving the iron produced will correspondingly differ in total carbon content. The level of maximum combustion is thereby altered, the rate of carburization affected and the melting zone level raised or lowered.

All these modifications affect the structural composition of the cast iron produced, even though the chemical composition be little different in irons smelted from such different raw materials as flue cinder and lean oolitic ores.

Study of Structural Composition Necessary

Chemical composition is not the final index to quality. Chemical analysis is a satisfactory index to the

constitution of the products of a particular furnace working on definite lines and using burdens of regular composition and physical structure. But the chemical analysis does not tell the whole story, wherever a furnace is constantly changing its fuel, ores, flux and rate of driving.

Examination of fracture alone is unsatisfactory,

Table III

APPROXIMATE CHEMICAL ANALYSIS OF THE TWO PIG IRONS

	T.C.	C.C.	Gr.C.	Si.	Mn.	S.	P.
Open-grained iron.....	3.30	0.30	3.00	1.8	1.0	0.08	1.0
Close-grained iron.....	3.30	0.65	2.65	1.7	0.9	0.10	1.0

STRUCTURAL COMPOSITION

	Open-Grained Iron		Close-Grained Iron	
	Per Cent Weight	Per Cent Volume	Per Cent Weight	Per Cent Volume
Graphitic carbon.....	3.00	9.52	2.65	8.52
Phosphide eutectic (C-Fe-P)	14.73	14.45	14.72	14.60
Manganese sulphide....	0.22	0.39	0.27	0.49
Pearlite (containing Si and Mn).....	2.83	2.58	42.40	39.00
Silico-ferrite	79.22	73.06	39.96	37.39
	100.00	100.00	100.00	100.00

but there is little doubt that the structural analysis of cast iron is reflected in some measure by the fractured casting structure, even as examined by the naked eye, for it is an index to that important factor, grain size.

A typical illustration may be given of the case of two blast furnaces producing foundry pig iron of similar analysis, the only notable difference in the chemical analysis of the pig irons being in the relation of the combined and graphitic carbon contents. The pigs were of the same section size and the total carbon content was in each case approximately the same, 3.3 per cent. Yet in one case the fracture was regularly open grained and in the other close grained.

Assuming that the molten metal consists of the 4.3 per cent carbon and the iron-carbon-phosphorus eutectics in which are dissolved the iron silicide and manganese carbide and sulphide, the molten constituency of the metal is given thus:

	Per Cent by Weight
4.3 per cent carbon eutectic.....	70.95
Iron-carbon-phosphorus eutectic.....	14.72
Iron silicide, manganese sulphide and iron (free)	14.33

Both irons here are therefore hypo-eutectic, a fully eutectic iron of 1.8 per cent silicon and 1.0 per cent phosphorus content having a total carbon content of approximately 3.5 per cent.

The Fracture Index

An intelligent interpretation of the pig fracture, combined with the practice of reading the chemical analysis in terms of the micro-structure, is of the greatest possible value to the foundryman and to the responsible worker in puddled iron and steel manufacture. The experienced puddler in Britain looks askance when he is asked to puddle a charge of iron possessing what he calls a mixed fracture, which is generally of the nature of an open-grained structure in which patches of close-grained metal are embedded. One part of the metal comes to grain normally while the other remains steely and the tendency, unless great care and labor are expended, is for the puddled ball to be uneven in plasticity, composition and weldability.

Knowing as we do the migratory character of carbon, as shown in the processes of cementation, case hardening, malleablizing and graphitization, is it not remarkable that so little attention has been given to the structural homogeneity of pig iron and to the means for producing iron of such regular structure as will, when properly remelted and poured, produce iron castings whose internal architecture shall not need costly methods of heat treatment to rearrange a struc-

ture which has been primarily confused and segregated in the blast furnace?

Slag in Ferrous Processes

In the three types of pneumatic furnaces used in the iron and steel industry the slags play an important part in controlling not only the composition of the metal, by means of thermo-chemical reactions between the constituents of the metal and the slags, but by their physical condition as mobile fluids act as absorbers of certain undesirable migratory constituents, such as sulphides and gases and, by virtue of their heat conductivity or resistivity, may aid or resist heat flow from the fuel or heating gases to the metal in contact.

In Table IV a summary is given of slag characteristics and in Figs. 2 and 3 graphs illustrative of the ruling types of slags in the transitions from the metastable to the stable neutral compositions may help in emphasizing the points raised. In Fig. 3 the progress of the transition from the acid to the neutral and finally basic condition of the working slags of the basic open-hearth steel process is shown.

Table IV

Process	Nature of First Slags	Inert or Neutral Constituents	Nature of Finishing Slags	Excess Constituents in Slags
Blast furnace	Acid	2 CaO.SiO ₂ 2 MgO.SiO ₂ 2 Al ₂ O ₃ .3SiO ₂	Basic	CaO and MgO
Cupola	Acid	2 CaO.SiO ₂ 2 MgO.SiO ₂ 2 Al ₂ O ₃ .3SiO ₂	Acid	SiO ₂
Acid Bessemer	Acid	2 FeO.SiO ₂ 2 MnO.SiO ₂ 3 FeO.Fe ₂ O ₃	Acid	SiO ₂
Basic Bessemer	Acid	2 FeO.SiO ₂ 2 MnO.SiO ₂ 2 CaO.SiO ₂ 2 MgO.SiO ₂ 5 CaO.P ₂ O ₅ 3 CaO.Fe ₂ O ₃	Basic	CaO
Acid open-hearth	Acid	2 FeO.SiO ₂ 2 MnO.SiO ₂ 3 FeO.Fe ₂ O ₃	Acid	SiO ₂
Basic open-hearth	Acid	2 FeO.SiO ₂ 2 MnO.SiO ₂ 2 CaO.SiO ₂ 5 CaO.P ₂ O ₅ 3 CaO.Fe ₂ O ₃ or 3 FeO.Fe ₂ O ₃	Basic	CaO
Puddling furnace	Acid	2 FeO.SiO ₂ 2 MnO.SiO ₂ 5 FeO.P ₂ O ₅ 3 FeO.Fe ₂ O ₃	Basic	FeO
Electric furnace	Basic	2 CaO.MgO.SiO ₂ 2 MnO.FeO.SiO ₂	Basic	CaO

No figures have been given relative to electric furnace slags but their composition progresses from a feebly basic condition to a strongly basic one, the high temperatures available being sufficient to keep slags of high lime content in the fluid state. Such slags function well as absorbers of sulphur and phosphorus.

In the manufacture of puddled iron the iron grains are formed primarily during the supercooling of the alloy on the borderland between cast iron and steel (1.8 to 2.0 per cent carbon). The grains grow rapidly and have envelopes of very pure iron. The centers of the grains, or clusters of grains, are richer in carbon than the outer envelope. The squeezed plastic mass of puddled iron is composed of crystal grains of similar form and often of similar size to those associated with the structure of slowly cooled cast iron. The grain size in puddled iron is influenced by the manganese, silicon and phosphorus content of the pig iron from which the iron is made and, in some cases, the original carbon content of the pig iron appears to play a part.

Puddled iron may therefore be considered as being the result of slowly cooling a cast iron through the higher temperature ranges, the carbon, silicon, manganese and phosphorus being removed by oxidation during the liquid and plastic ranges. The gradual reduction of carbon during the plastic period is equivalent to the graphitization and decarburization which take place during the malleable white-heart process. The two final and stable structures are remarkably similar,

both in the form and size of the polyhedral iron grains—in the wrought iron and in the completely decarburized areas of the malleable cast iron. The coincidence of low manganese and silicon content in similarly grained wrought iron and malleable cast iron should be noted.

The Scrap Problem

The difficulty of estimating for any country, with any degree of accuracy, the percentage of scrap produced in terms of the tonnage of pig iron, iron castings, steel and iron rolled, forged, stamped and drawn material, and of steel castings and ingots, per annum, is admittedly great. But to get even a rough idea of the trend of manufacturing methods, the function of scrap in ferrous processes must be visualized.

Altogether it will be seen that at the present time, to use up the bulk of scrap available and to prevent its too rapid loss through corrosion alone, the mixtures for steel furnaces, foundry cupolas, and wrought iron scrap furnaces must contain increasing percentages of scrap. The growing use of direct metal from the blast furnace to the steel furnace throws a larger scrap proportion upon the remaining furnaces using solid charges.

One factor, if not the greatest in this scrap problem, is the effect now being felt in pig iron production. The temptation to use scrap, of a nature unusable in steel and iron melting furnaces, as additions to the ore charges in blast furnaces, cannot be ignored by the foundryman, who often is puzzled to know the reason for abnormal happenings in his castings.

Much remains to be known concerning the influence of repeated remelting of iron on the structure of the product, as compared with the remelted virgin pig iron structure. Every foundryman has his own conception of the value of certain proportions of casting scrap in his mixtures and, as a consequence, cupola charges vary between all-pig and all-scrap mixtures. How do these variations affect the structure of the product, apart from the pure chemical analysis of the ingredients of the charge and of the resulting castings?

Consideration of the effects of scrap percentages in a cupola or air furnace charge results again in the conclusion that the structural composition of the product is the all-important question. It would appear that homogeneity of cast structure is the index to the quality of irons of similar chemical analysis and of similar mean constitutional analysis.

As an illustration of the sulphur influence in deteriorating English white-heart malleable, the result of repeated use of scrap from preceding melts, the graph Fig. 4 is given. In the same diagram the sulphur deterioration during the cupola melting, of pig iron containing 0.08 per cent and scrap containing 0.10 per cent sulphur, is given. In each cast the scrap used is assumed to be taken from the preceding melt, the sulphur addition per melt being estimated as 0.03 per cent.

In practice of course the scrap produced is not sufficient for the succeeding melt and foreign scrap has to be purchased. If the latter could be guaranteed to contain as low a sulphur content as the pig iron the scrap from the succeeding melts would increase much more slowly in sulphur content and it would take longer to reach the danger limit.

By the same method of attack, the influence of scrap proportions on grain growth in the metal cast from similarly remelted pig iron and scrap mixtures is capable of determination. The oxidation of the iron, silicon and manganese can also be progressively traced in relation to the number of remeltings and pig plus scrap proportions in the charges.

Discussion

Dr. Richard Moldenke pointed out that it is rare to find a man with the broad qualifications of Mr. Fletcher in handling a subject such as that which he had presented. The author of the paper is not only a foundryman, but also a blast furnace man and a puddler. Mr. Fletcher knows all of these fields, their limitations and requirements, and he can correlate them to an unusual degree. His idea of making a tentative line of division between unoxidized metal as it exists in pig iron and

the oxidized metal resulting from remelting and further working is one happily chosen for his purpose. At the last meeting of the German Foundrymen's Association it was made known that investigations were bearing fruit by which oxide of iron can be determined by chemical analysis. This large stride forward will be of great importance both to the foundry industry and to the steel industry.

Pointing out that there is room in the United States both for a cast iron research association and also a blast furnace research association, Doctor Moldenke continued by stating that an open-grained iron may be the result of a poorly-gated casting. This results in a surface freeze before the interior of the casting has an opportunity to set, and without proper gating there is no reservoir of metal to fill in the interior as solidly as it should be filled. On the other hand, an iron which is poorer in quality may make sounder castings, by reason of freezing inside very quickly and thus avoiding the difficulty just mentioned.

James T. McKenzie, chief chemist American Cast Iron Pipe Co., Birmingham, Ala., suggested that one of the large questions requiring further study is that of the specific heat of iron above its melting point. He expressed regret that the British Cast Iron Research Association is pursuing the policy of withholding from publication the results of its studies. He made a strong plea for publication of these results, so that the benefit obtained from the studies might be more generally shared among foundrymen all over the world.

In his closure, Mr. Fletcher pointed out that the association which he represented was a "war baby" and as such necessarily was hedged about with many

restrictions when it was formed. It is supported one-half by the British Government and one-half by the manufacturers forming its membership. Its charter provided that the information obtained should be shared by these interests. He hopes that its usefulness may be broadened along the lines suggested and indeed this has been done in some respects. This, however, will have to come from the interests now controlling the association.

Mr. Fletcher paid a high tribute to the work which the German investigators, mentioned by Doctor Moldenke, have been doing. He stated that results already attained will be likely to be published within the next six months, and that these results go a long way in the direction of direct analysis for oxides. He spoke further of the fact that, although British blast furnaces are much smaller than those in the United States, and operating on low blast pressures, they are turning out a high quality of iron. This quality recently has suffered somewhat because of the upset condition of the entire industry and the imperative necessity to cut costs. Generally speaking, however, the quality was claimed to be second to none.

Much attention is being given in England to macro-structure of metals in distinction to the micro-structure. It seems to be easier for the average mind to comprehend something magnified only a half dozen diameters than when it is magnified from 100 to 1000 diameters. The smaller magnification is more nearly in keeping with what one sees with the naked eye and the study, therefore, of low magnifications has been of great help in showing some of the differences of iron in certain cases.

Beta Iron and the Specific Heats of Pure Iron*

The existence of beta iron cannot be considered as proved, in spite of the large amount of work which has been devoted to the solution of the problem. The only proof which can be adduced in favor of its existence is the fact that many of the properties of iron vary at the point A_2 ; and even the very fine work of Burgess and Crowe (*Bulletin A. I. M. and M. E.*, page 2537, Oct., 1913), which is considered by many to be conclusive proof of the existence of beta iron, failed to convince such eminent authorities as H. LeChatelier, Hadfield, McCana and others. On the other hand, there are several very good reasons for doubting the existence of beta iron, among which may be mentioned:

1. Complete identity of the microscopic structure of the crystalline networks of alpha- and beta-irons (Westgren, 1921-22);
2. There is no sharp transition in properties at the point A_2 , the changes at this point becoming clearer with increase in the carbon content;
3. The fact that the line MO is horizontal, and that it therefore has the character of a eutectic line and not that of a line separating two allotropic modifications;
4. Absence of a straight horizontal portion GO on the curve GOS (Göhrrens and Mayer, 1910).

All these facts tend to show that the point A_2 is not due to beta iron but to a compound of alpha iron and carbon, the nature of which is as yet unknown. Experimental evidence could be obtained by studying an absolutely carbon-free iron. Such an iron cannot be obtained; but it is possible to extrapolate to a zero carbon content results obtained with various carbon contents.

In 1912 A. Meuthen published results on the measurement of the specific heats of 12 samples of iron, containing from 0.06 to 4.22 per cent of carbon, at temperatures of 640 to 920 deg. C. The measurements were very accurate and all necessary precautions had been taken. The author extrapolated these results to zero carbon content, using four different methods, both graphic and analytical, all of which gave concordant results, agreeing within the limits of accuracy of

Meuthen's measurements. Such an agreement is certainly an excellent proof that the errors are not due to the extrapolation method. Moreover, the reasonableness of the figures obtained for carbon-free iron is confirmed by the disappearance of A_2 , which was to be expected, though the point was quite distinct on Meuthen's curves from which the author calculated his extrapolations.

Between 640 and 900 deg. C. the extrapolated curve is a straight line corresponding very closely to the equation:

$$W' = -51.9 + 0.2211t$$

and it does not show the least sign of the points A_1 and A_2 . It is seen, therefore, that the specific heat curve of pure carbon-free iron does not indicate the transformation from alpha to beta iron. As allotropic modifications of a substance possess different internal energies, passage from one modification to another should be accompanied by a thermal effect of some sort. The extrapolation curve obtained from Meuthen's results therefore weakens considerably the fundamental proofs in favor of the existence of beta-iron.

From this curve the author deduced a formula by means of which he was able to calculate the specific heat of pure iron from zero degree absolute to its melting point. The values thus calculated agree very well with those of Griffiths and of Pionchon for medium temperatures, at which the carbon does not exert very much influence; and, what is more important, they agree perfectly with those of Günther for the range between -241 and -178 deg. C., at which the effect of carbon does not make itself felt at all. At high temperatures the effect of carbon becomes appreciable, and all the experimental curves (Oberhoffer, Harker, Meuthen, etc.) lie above the calculated curve, as was to be expected.

As these formulas were obtained from a single thermal datum (the heat of the iron extrapolated at 770 deg. C.), and as they have been shown to be accurate and to agree with experimental results even at temperatures 1000 deg. below that which served as a starting point, it is quite safe to apply these same formulas to higher temperatures, right up to the melting point of iron.

The author is thus the first to have obtained the curves representing the total heat and the specific heat of pure, carbon-free iron from zero degree absolute to the melting point, 1780 deg. absolute (1507 deg. C.).

*Abridged translation by A. Papineau-Couture of an article by A. Brodsky in *La Revue de Metallurgie*, May, 1925.

Trade Changes

The Leland Gifford Co., Worcester, Mass., has discontinued carrying a stock of its products in Chicago, and will henceforth ship direct from the factory.

The United States Electrical Tool Co., Cincinnati, has opened a New England office at 514 Atlantic Avenue, Boston. Ralph E. Bell has been appointed district manager for New England and will have charge of this office.

The American Equipment Co., Detroit, has taken on electrical drills, grinders and polishers of the United States Electrical Tool Co., Cincinnati, for metropolitan Detroit. The company will handle no other make of electrical tools.

The New York office and warehouse of the Edgar Allen Steel Co., Inc., 86 John Street, will soon be removed to larger quarters at 194 Front Street, New York.

The Midwest Air Filters, Inc., has moved its office from 100 East Forty-fifth Street, New York, to the location of the factory at Bradford, Pa. This is with the idea of eliminating duplicate effort and maintaining closer control. A branch sales office will be maintained at 100 East Forty-fifth Street, New York, in conjunction with the Midwest Steel & Supply Co.

Harnischfeger Sales Corporation, distributor for Harnischfeger Corporation, Milwaukee, announces the location of a branch office at Charlotte, N. C., in the Independence Trust Building. W. J. Henry is district manager, in charge.

The Youngstown Sheet & Tube Co. is occupying additional space in the Stambaugh Building, Youngstown, Ohio, where its general headquarters are located. In 1926 the company will occupy five floors of the building. The traffic department, headed by Albert Graham, is being removed from the Brier Hill works office to the Stambaugh Building and will occupy the entire eighth floor. The publicity department, in charge of R. J. Kaylor, will be located on the ninth floor.

The Newton Steel Co., Youngstown, now occupies the entire ninth floor of the new First National Bank Building, having moved from the Stambaugh Building.

The Bessemer Limestone & Cement Co., Youngstown, Ohio, is moving its sales and administrative offices from the plant office building at Bessemer, Pa., to the Stambaugh Building, Youngstown.

The Power Equipment Co., 315 Third Avenue, North, Minneapolis, now represents Foote Brothers Gear & Machine Co., Chicago, on industrial gears, spur, worm and herringbone speed reducers.

Miller, Carson & Co., Inc., 220 South Sixteenth Street, Philadelphia, dealer in pig iron, coal and coke, has changed its corporate style to J. G. Miller & Co. Irvin V. Shaw, for several years connected with J. G. Miller in the pig iron, coal and coke business at Dubois, Pa., has been appointed sales manager.

Plans of New Companies

Nu-way Factory Service, 3 Court Street, Newark, N. J., has been organized with a capital of 2500 shares of stock of no par value, to manufacture and deal in oil machinery and parts. The present business is the sale and installation of domestic and industrial oil burning plants in northern New Jersey, and present plans call for no manufacturing. The company is not in the market for materials or equipment.

The Beach Carburetor Co., Belleville, N. J., has been organized to manufacture carburetors. A manufacturing plant at 301 Cortlandt Street, Belleville, is occupied. The company purchases gray iron and brass in castings, rods and tubes. R. H. Beach is president.

The Philadelphia Shovel Co., Tacony and Sanger Streets, Philadelphia, has been organized to manufacture hand shovels and scoops. The contract has been awarded and the building has been started. Lynford Rowland, Jr., is president and treasurer and Allen M. Stearne, secretary.

The Safe and Sure Auto Signal Co., 225 East Broadway, Long Beach, Cal., has been incorporated for \$75,000 to manufacture traffic direction signals for installing on automobiles, to indicate to cars in the rear the movements which are next to be undertaken. At present manufacturing is by contract and it is planned to extend the business to the East. A factory may be erected later. Bert C. Smith is president.

A. C. Denman, Jr., and A. W. Grier, formerly president and secretary, respectively, of the Southern California Iron & Steel Co., Los Angeles, Cal., have formed the Denman & Grier Steel Co., with a warehouse at 826 Santa Fe Avenue, that city, in which will be carried steel bars, shapes, bolts, nuts, rivets, lag screws, high-speed tool steels and other steel products.

Industrial News Notes

The Kent Machine Co., Kent, Ohio, announces the recent purchase of the Falls Clutch & Machinery Co., Cuyahoga Falls, Ohio. The present intention is to manufacture the old established line of transmission machinery at both plants, thereby greatly increasing production facilities and adding materially to the effectiveness of the service. The officers of the Kent company are: M. G. Garrison, president; J. G. Getz, vice-president; R. H. Smith, treasurer; S. B. Beck, secretary-general manager. The board of directors consists of the foregoing officers and J. W. Salter, Kent, Ohio, and T. King and D. King, both of Quincy, Mass. The company announces that a new sales policy is to be inaugurated by which their products are to be sold through mill supply companies and factory representatives in the various trade centers. The Kent company is indirectly affiliated with the Lamson & Sessions Co., Cleveland.

The Automatic Musical Instrument Co., 1500 Union Avenue, S. E., Grand Rapids, Mich., has been organized as a Delaware corporation. It has purchased assets of the National Piano Mfg. Co., Grand Rapids, which has been engaged in the operation and manufacture of coin-controlled automatic pianos for the past 16 years and during that period has been closely associated with the National Automatic Music Co., also engaged in operating automatic pianos. W. Ioor is president and general manager; Joseph Renihan, vice-president, and S. D. Thompson, secretary and treasurer.

The Standard Silica Co., Ottawa, Ill., and Chicago, producer of Blackhawk brand steel molding, foundry and glass sands, has purchased the Crescent Silica Co., Ottawa. The acquisition adds to the Standard company's holdings 82 acres in the heart of the Ottawa district, including a modern concrete and steel washing and drying plant and other equipment. The capacity of the Standard company has been doubled.

The Saco Tool & Die Co., 144 Pine Street, Providence, R. I., has succeeded E. F. Rueckert in a business as designer, toolmaker, hub and die cutter, with automatic and fine piercing tools a specialty.

New Books Received

Machine Design, Construction and Drawing. By Henry J. Spooner. Pages 762, 5¼ x 8¼ in., illustrated. Published by Longmans, Green & Co., 55 Fifth Avenue, New York. Price, \$7.

Wire Drawing and the Cold Working of Steel. By Alastair T. Adam. Pages 212, 7½ x 10 in., illustrated. Published by H. F. & G. Witherby, 326 High Holborn, London, W. C. 1. Price, 40s.

Conferences, Committees, Conventions. By Edward Eyre Hunt. Pages 218, 5¼ x 8¼ in. Published by Harper Brothers, 49 East Thirty-third Street, New York. Price, \$2.50.

Guide to Heating and Ventilation. Pages 524 + 52, 6¼ x 9¼ in., illustrated. Published by the American Society of Heating and Ventilating Engineers, 29 West Thirty-ninth Street, New York. Price, \$3.

Drafting Methods. By Douglas S. Trowbridge. Pages 154, 5¼ x 8¼ in., illustrated. Published by Codex Book Co., Inc., 461 Eighth Avenue, New York. Price, \$2.50.

The Sheet-Metal Worker's Instructor. By Reuben Henry Warn and Joseph G. Horner. Pages 224, 5 x 7½ in., illustrated.

The Mineral Industry During 1924. Vol. xxxiii. Edited by G. A. Roush. Pages 917, 6½ x 9½ in., illustrated. Published by McGraw-Hill Book Co., Inc., 370 Seventh Avenue, New York.

Carnegie Scholarship Memoirs. Vol. xiv. Edited by George C. Lloyd. Pages 186, 5½ x 8½ in., illustrated. Published by the Iron and Steel Institute, 28 Victoria Street, London, S. W. 1.

Journal of the Iron and Steel Institute. Vol. cxi. Edited by George C. Lloyd. Pages 675, 5½ x 8½ in., illustrated. Published by the Iron and Steel Institute, 28 Victoria Street, London, S. W. 1.

Labor Laws of the United States with Decisions of Courts Relating Thereto. Pages 1240, 5¼ x 9 in. Issued by the United States Department of Labor, Bureau of Statistics, Washington.

Machinery Markets and News of the Works

BUYING LESS ACTIVE

December Machine Tool Business Declines in Some Sections

Norfolk & Western Railroad Placing Orders—Chrysler Motor Corporation Reported to Have Placed Large Order

THE Norfolk & Western Railroad is beginning the distribution of orders against a list of about 80 machine tools issued a few months ago. Other important machine tool business consists of a reported order for about \$100,000 worth of grinding equipment from the Chrysler Motor Corporation and an order for 25 automatic screw machines placed by a Dayton, Ohio, company.

Buying by automobile manufacturers has subsided to some extent. Manufacturers in other lines are also less active purchasers. The approach of the annual inventory period very frequently slows down the buying of equipment at this time of year. Reports from Cincinnati manufacturers indicate a very good year-end business, but in other centers indications point to a smaller volume in December than was received in November.

The Oakland Motor Car Co., Pontiac, Mich., has mapped out a large expansion program and is placing some orders. There is a fair amount of general buying, usually in lots of one, two or three tools. The New England market is very quiet and in the New York district the tendency is toward restricted buying, this being particularly true of the larger companies.

New York

NEW YORK, Dec. 8.

MACHINE-TOOL business is running in about the same course as last month, except that indications point to a slightly smaller volume in December. The New York Central has issued inquiries for several tools, but otherwise most of the pending business is in single tools. Machine-tool builders are submitting bids on a list of tools for a railroad in New Zealand, but as the quotations have to go to that country for a decision the purchases probably will not be made for two or three months. The week's orders include the following: Morse Twist Drill & Machine Co., New Bedford, Mass., three automatic lathes; Wildman Mfg. Co., Norristown, Pa., two Pratt & Whitney profiling machines; North East Electric Co., Rochester, N. Y., a duplex thread hobbing machine; Ingersoll-Rand Co., New York, two 6-ft. radial drills.

In connection with the proposed electrification of its Westside freight line, New York City, the New York Central Railroad Co., Grand Central Terminal, plans the construction of two automatic power substations on Seventy-second Street and 158th Street, respectively, to cost close to \$400,000 with equipment. The entire project, including electric locomotives, oil-electric equipment, etc., will cost \$25,000,000.

The Empire Plating Works, Inc., 77 Madison Avenue, Albany, N. Y., will soon take bids on revised plans for a three-story addition, 25 x 35 ft., to cost \$27,000. James S. Shattuck, Benson Building, is architect.

The Mack International Motor Truck Corporation, 25 Broadway, New York, plans the construction of a new three-story assembling plant at University and Cromwell Avenues, St. Paul, Minn., to cost about \$350,000 with equipment.

The Board of Education, Far Rockaway, L. I., plans the installation of manual training equipment in its proposed four-story high school to cost \$1,500,000, for which bids will soon be asked on general contract. William H. Gompert, Flatbush Avenue Extension and Concord Street, Brooklyn, is architect.

The Cities Service Power & Light Co., recently formed under Delaware laws to take over the light and power utilities of the Cities Service Co., 60 Wall Street, New York, in Missouri, Ohio, Kansas and other states, is disposing of a preferred stock issue of \$10,000,000, a portion of the fund to be used for extensions and improvements. Henry L. Doherty is president.

The Standard Sanitary Mfg. Co., Bessemer Building, Pittsburgh, has awarded a general contract to J. H. Wiles, 8 West Fortieth Street, New York, for extensions and improvements in its factory branch and distributing plant at

558 Jackson Avenue, Long Island City, to cost approximately \$36,000. Walter S. Timmis, 315 Fifth Avenue, New York, is architect.

M. K. Frank, 15 Park Row, New York, iron and steel merchant, has inquiries out for a snow plow, standard gage.

The International Projector Corporation, New York, has been formed under Delaware laws to take over and consolidate the Nicholas Power Co., Inc., 90 Gold Street, the Precision Machine Co., 317 East Thirty-fourth Street, both New York, and the Acme Motion Picture Projector Co., 1134 West Austin Avenue, Chicago, all specializing in the manufacture of motion picture projector machines, parts and other precision equipment. The plants will be continued and expanded. The new organization has arranged for a preferred stock issue of \$2,500,000, a portion of the fund to be used for carrying out the merger and for extensions. B. A. Squire is vice-president.

G. M. Bartlett, 102 Park Avenue, New York, architect, has plans for a two-story and basement automobile service, repair and garage building, 100 x 136 ft., at Mount Vernon, N. Y., to cost \$100,000 with equipment.

The Lightolier Co., 569 Broadway, New York, manufacturer of lighting fixtures, has leased the five-story building, 55 x 200 ft., at 379-81 West Broadway, for extensions, including storage and distributing plant.

The Packard Motor Car Co., Broadway and Sixty-first Street, New York, has acquired property at Columbus Avenue and Sixty-first Street, totaling about 20,000 sq. ft. and plans the erection of a multi-story service and repair building to cost \$350,000. It has also recently acquired a site at Broadway and Sherman Avenue for a similar structure.

George Dress, 103 East 125th Street, New York, architect, has taken out a permit to erect a six-story automobile service, repair and garage building, 100 x 101 ft., at 213-19 East Ninety-first Street, to cost \$200,000.

The American Type Founders Co., Kelly Press Division, Elmora Avenue and Grand Street, Elizabeth, N. J., has awarded a general contract to the Wigton-Abbott Co., 552 West Twenty-third Street, New York, for a one-story building at its local plant, devoted to the production of printing presses and parts, 160 x 160 ft. Day & Zimmermann, Inc., 1600 Walnut Street, Philadelphia, is architect and engineer.

The Board of Water Commissioners, Rahway, N. J., has plans for extensions and improvements in the municipal waterworks, including pumping machinery, aeration equipment, etc., to cost \$163,000. Hazen & Whipple, 25 West Forty-third Street, New York, are consulting engineers.

The Star Electric Motor Co., 142 Miller Street, Newark, N. J., has awarded a general contract without competition to the Essex Construction Co., 9 Hackett Street, for a new two-story plant, 70 x 90 ft., to cost about \$95,000 with machinery. Joseph Di Stasio and W. H. Jackson, 136 Liberty Street, New York, are architects. E. E. Hollander is president.

The City Council, Collingswood, N. J., is said to be planning the purchase of pumping machinery for well service, totaling 2400 gal. per min., in connection with extensions in the water system to cost \$75,000. Remington & Vosbury, 501 Cooper Street, Camden, N. J., are engineers.

The Church Brick Co., Fieldsboro, N. J., has acquired the former plant of the Pardee Brick Co., at Maple Shade, N. J. The works will be remodeled and new machinery installed to develop an output of 40,000 brick per day. The present plants at Fieldsboro will be continued.

The American Brown Boveri Electric Corporation, 165 Broadway, New York, has acquired the plant and business of the Moloney Electric Corporation, Seventh and Hickory Streets, St. Louis, manufacturer of electric transformers and parts, and will operate as a new division, to be devoted exclusively to transformer production. Expansion is planned.

New England

BOSTON, Dec. 7.

CONTRARY to expectations, buying of machine tools in this market continues in small volume. Inquiries also have fallen off materially and call mostly for used equipment. New England machine tool builders, on the other hand, are busy. Some expect a falling off around the first of the year unless new orders are received, but a majority have sufficient business booked to continue operations on present schedules well into 1926.

The foundry of the William J. Collins Foundry Co., Milford, Mass., was destroyed by fire last week with an estimated loss of \$15,000.

C. I. Brink, Inc., Gold Street, South Boston, electrical signs and motors, contemplates the erection of a plant extension. The architect has not been selected.

The New England Smelting Co., Union and Day Streets, West Springfield, Mass., has awarded contract for extensive plant alterations. Isaac Brown is president. J. C. W. Foster, 105 Bridge Street, Springfield, is the architect.

The Morton C. Tuttle Co., 862 Park Square building, Boston, has the general contract for a machine room extension, 39 x 361 ft., at Augustine mills, Wilmington, Del., for the Jessup & Moore Paper Co., Philadelphia. Motors and miscellaneous equipment are needed.

Plans are completed for a one-story, 60 x 150 ft. manufacturing plant on Pierce Street, Chelsea, for Gordon & Gerber, 20 Summer Street, metals. S. S. Eisenberg, 46 Cornhill, Boston, is the architect.

Plans will not be ready until spring for the proposed \$300,000 manufacturing plant additions and alterations at Hudson, Mass., contemplated by the Firestone Apsley Rubber Co., 520 Atlantic Avenue, Boston, for which miscellaneous electrical and mechanical equipment will be required.

The H. B. Smith Co., Westfield, Mass., heating appliances, contemplates the erection of two additional plant units consisting of a machine shop to cost \$43,000 and a core room costing \$11,000.

The American Radio & Research Corporation, Medford Hillside, Mass., one of the pioneers in its field, has been purchased by Powell Crosley, Jr., president Crosley Radio Corporation, Cincinnati, who has reorganized the company under the name of the Amrad Corporation, Columbus, Ohio. Harold J. Power will be general manager. It is proposed to start operations at the Massachusetts plant. The purchase of small equipment is under consideration.

The Peck, Stow & Wilcox Co., Southington, Conn., manufacturer of tools and hardware products, has awarded a general contract to the H. Wales Lines Co., Meriden, Conn., for a two-story machine shop, 60 x 183 ft.

The Central Railway Signal Co., 230 Boylston Street, Boston, has awarded contract to the Dacey & Tibbetts Co., 70 Porter Road, Cambridge, Mass., for a two-story building at 272 Centre Street, Newton, Mass., 35 x 62 ft. S. D. Hayden, 77 Highland Avenue, Newtonville, Mass., is architect.

Fire, Dec. 3, destroyed a portion of the automobile service, repair and garage building of the Checker Taxicab Co., 4 St. Botolph Street, Boston, Back Bay district, with loss estimated at \$50,000. It is planned to rebuild.

The American Soda Fountain Co., 282 Congress Street, Boston, has asked bids on a general contract for a one and two-story addition, 175 x 375 ft., to cost \$50,000. Monks & Johnson, 99 Chauncy Street, are architects.

The Boston Auto Supply Co., 96 Bridge Street, Lowell, Mass., will install a machine and repair shop in a one-story addition, 46 x 200 ft., for which a general contract has been awarded to the Runels Construction Co., Hildreth Building. Davis & Byam, Hildreth Building, are architects.

The Gulf Refining Co., 21 State Street, New York, has acquired property at Palmer, Mass., and will build a new storage and distributing plant to cost about \$60,000 with equipment.

The Panco Rubber Co., Highland Street, Chelsea, Boston, has plans for a one-story addition, 50 x 62 ft., to cost \$45,000 with equipment.

Officials of the New England Co., Worcester, Mass., operating the New England Power Co., and other utilities, are organizing the New England Power System to take over and expand the present properties and acquire additional utilities. It is purposed to provide additional capital to total \$20,000,000, a portion of the fund to be used for expansion. The International Paper Co., New York, and Stone & Webster, Inc., Boston, will be prominent in the new organization.

Landers, Frary & Clark, New Britain, Conn., manufacturer of electric heating and cooking equipment, has asked bids on a general contract for an addition to be known as factory No. 25. M. J. Unkelbach, New Britain, is architect.

The Parker-Young Co., 131 State Street, Boston, manufacturer of paper and pulp products, is concluding negotiations for about 22,000 acres of timber property at Waterville, N. H., now held by the International Paper Co., New York. The purchasing company contemplates the construction of a saw mill, with power house, machine shop and auxiliary structures to cost more than \$50,000. Facilities will also be installed for handling small wood stocks for the pulp mill now operated at Lincoln, N. H.

The Fisk Rubber Co., Chicopee Falls, Mass., manufacturer of automobile tires, plans a note issue of \$10,000,000, a portion of the fund to be used for expansion and betterment.

The Webb Oil Co., 8 Durfee Street, Fall River, Mass., has plans for a two-story automobile service, repair and garage building, 105 x 120 ft., for company motor trucks and cars, to cost approximately \$75,000. Greany & Sherry, 825 Dayol Street, are architects.

Contract was awarded Dec. 4 to the Pittsburgh Valve Foundry & Construction Co., 2700 Railroad Street, Pittsburgh, for piping for the new Mystic blast furnace, Everett, Mass.

Philadelphia

PHILADELPHIA, Dec. 7.

THE Slaymaker Mfg. Co., 3271 Woodland Avenue, Philadelphia, has taken out a State charter with capital of \$105,000 to manufacture flashlights and other electrical appliances. The company contemplates the establishment of an assembling plant. W. W. Slaymaker, 4600 Chestnut Avenue, is treasurer.

The National Milling & Chemical Co., Harpers Mill Road, Philadelphia, contemplates rebuilding the portion of its plant recently destroyed by fire with loss estimated at \$100,000, including equipment.

The M. Rice Co., 1224 Spring Garden Street, Philadelphia, manufacturer of wire specialties, has acquired a factory at 1134-48 North American Street, on site 140 x 145 ft., and contemplates the establishment of a plant. It is understood that the present factory will be removed to the new location.

Hood Brothers, Palethorpe and Oxford Streets, Philadelphia, manufacturers of hardware products, have awarded a general contract to Wintz Brothers, 1618 Sellers Street, for a one-story plant, 25 x 100 ft., at 4336 Orchard Street.

I. Halpern Brothers & Co., Inc., 1333 North Front Street, Philadelphia, metals, has awarded a general contract to Louis Rosengarten, Otis Building, for its proposed plant on Erie Avenue, comprising three buildings to cost approximately \$85,000. Edwin L. Rothschild, 1420 Chestnut Street, is architect.

Fire, Nov. 30, destroyed a portion of the plant of M. P. Philpot & Co., 134 North Front Street, Philadelphia, manufacturer of paper boxes and containers, with loss reported in excess of \$20,000. It is planned to rebuild.

The American Brown Boveri Electric Corporation, Camden, N. J., operating at the former local plant of the New York Shipbuilding Co., is making improvements in two of the buildings at the south yards of the plant at Gloucester, to be used as a foundry and for assembling, respectively. Headquarters are at 165 Broadway, New York.

The Acme Staple Co., Haddon Avenue, Camden, N. J., has awarded a general contract to Paul Brosz, 2515 West Huntingdon Avenue, Philadelphia, for its proposed two-story and basement addition, 90 x 170 ft., to cost \$100,000 with equipment. Clarence E. Wunder, 1520 Locust Street, Philadelphia, is architect.

J. T. Evans, 158 South Main Street, Wilkes-Barre, Pa., heating and plumbing equipment, has asked bids for a one

The Crane Market

INQUIRIES for overhead equipment are still confined to requests for prices on single items, but there is a fair volume of this business in prospect, although current purchasing is light. The locomotive crane market is still quiet but a fair number of inquiries are being quoted upon and price advances are reported under consideration. Included in pending business is an inquiry from the New York, New Haven & Hartford Railroad for four hand power cranes with electric hoists and one from the General Electric Co. for a 2-ton small headroom overhead crane for Schenectady, N. Y. The Morris Engineering Co., 30 Church Street, New York, has purchased 10 locomotive cranes, two 30-ton, two 25-ton, two 22½ ton, two 20-ton and two 15-ton, from the Ohio Locomotive Crane Co. for resale.

In the Pittsburgh district the Carnegie Steel Co. will probably place two cranes for the Duquesne works, this week, but the 15 cranes for Homestead are expected to be carried into next year. Formal inquiry for cranes from the Wierton Steel Co. is expected soon. In Chicago the Atchison, Topeka & Santa Fe Railroad is inquiring for a 15-ton electric overhead crane, 40-ft. span for Albuquerque, N. Mex.

Among recent purchases are:

American Cast Iron Pipe Co., Birmingham, Ala., two 5-ton, 40-ft. span, 3-motor overhead cranes from the Niles-Bement-Pond Co.

Chesapeake Corporation, West Point, Va., a 7-ton, 33-ft. 7-in. span hand power crane from the Niles-Bement-Pond Co.

Richmond Radiator Co., 1480 Broadway, New York, a 5-ton hand power crane from the Whiting Corporation.

General Electric Co., Schenectady, N. Y., two 2-ton electric traveling cranes for West Philadelphia, Pa., from the Whiting Corporation.

N. P. Nelson Iron Works, Inc., Passaic, N. J., a 7½-ton, 39-ft. span hand power crane from Alfred Box & Co.

Central Railroad of New Jersey, New York, two 30-ton locomotive cranes with magnets from the Ohio Locomotive Crane Co.

Pelham & Knight Co., Meigs, Ga., two 20-ton, 50-ft. span, used Brownhoist locomotive cranes from Philip T. King, New York.

Chesapeake & Ohio Railroad, Richmond, Va., two standard ditchers from the American Hoist & Derrick Co.

Levinson Co., Pittsburgh, a 5-ton, 66-ft. span crane for a scrap yard, from the Shepard Electric Crane & Hoist Co.

Champion Fibre Co., Canton, N. C., a 15-ton hand power trolley from the Niles-Bement-Pond Co.

and two-story shop, 50 x 115 ft., for machine work, pipe fitting, etc., at Kingston, Pa. Bissell & Sinkler, 1520 Locust Street, Philadelphia, are architects.

The Tyson Mfg. Co., Lock Haven, Pa., manufacturer of automobile tops, frames, etc., plans an addition for considerable increase in output.

Emil and Samuel Feldman, 27 South State Street, Wilkes-Barre, Pa., have plans for a two-story automobile service, repair and garage building, 100 x 123 ft., to cost \$75,000 with equipment. Bids will be taken at once.

The P. H. Fuller Co., Inc., 365 Gerard Avenue, New York, manufacturer of radio equipment, cabinets, etc., has work nearing completion on a new branch plant at Emporium, Pa.

The Board of Education, Petersburg, Pa., has awarded a general contract to Yenter Brothers, Tyrone, Pa., for a one-story and basement vocational school, 55 x 145 ft., to cost \$65,000. Hersh & Sholler, Commerce Building, Altoona, Pa., are architects.

The Shaffer Stores Co., 717 Green Avenue, Altoona, Pa., is said to be planning the installation of a cold storage and refrigerating plant in its proposed three-story packing plant on Ninth Avenue, 80 x 115 ft., to cost approximately \$175,000 with equipment. G. W. Shaffer is president.

Stockholders of the Harrisburg Foundry & Machine Works, Inc., Harrisburg, Pa., bankrupt, have called a special meeting on Dec. 18 to arrange a plan of settlement to creditors, closing bankruptcy proceedings against the company. It is said that the plant will be taken over and reorganization arranged. Five unsuccessful attempts have been made to dispose of the property at a public auction.

The Pennsylvania Power & Light Co., Allentown, Pa., has begun the construction of a new power plant near Laurys Station, to be used primarily as an automatic power substation for switching and distributing, reported to cost \$200,000 with equipment.

Bryon White, Williamstown, Pa., manufacturer of paper boxes, containers, etc., has arranged for the removal of his plant to a larger building near Clayton Avenue where the capacity will be considerably increased.

The Pennsylvania Gas & Electric Corporation, York, Pa., has arranged for a stock issue of \$1,687,500, a portion of the proceeds to be used for extensions and improvements in plants and system. H. A. Clarke is vice-president.

South Atlantic States

BALTIMORE, Dec. 7.

BIDS are being asked on a general contract until Dec. 14, by the Flynn & Emrich Co., 305 North Holliday Street, Baltimore, manufacturer of stokers, etc., for a one-story foundry addition, 100 x 260 ft., to cost \$55,000. W. S. Austin, Maryland Trust Building, is engineer.

The Sandhill Sand Co., Talbird Siding, Star, N. C., plans for extensions in its property, to include the installation of belt conveyors and other mechanical equipment. T. J. Ellis is secretary.

Fire, Nov. 28, destroyed a portion of the plant of the Empire Cotton Oil Mill Co., Valdosta, Ga., with loss estimated at \$100,000 including machinery. Plans for rebuilding are being considered.

McKeown Brothers, 112 West Adams Street, Chicago, building contractors, are reported to have secured a 5-acre site on Glenwood Avenue, Atlanta, Ga., for a new building material plant for the manufacture of wood trusses and other built-up products, to cost \$150,000 with equipment. John C. McKeown is head.

The Common Council, Monroe, N. C., contemplates the installation of pumping machinery in connection with proposed extensions and improvements in the municipal waterworks. Bonds for \$200,000 are being arranged for this and other work.

The Washington Steel Products Co., 815 Fifteenth Street, N. W., Washington, has inquiries out for two light hand cars, 36-in. gage, suitable for saw mill service; one vertical saw mill, 6 to 7 ft.; one boiler, 100 to 150 hp., to operate at 125 lb. working pressure, with smokestack, etc.

The general purchasing officer, Panama Canal, Washington, is asking bids until Dec. 23 for two gasoline engines, two electric center grinders, 12 locomotive driving wheel tires, 15,000 machine bolts, 300 railroad track splice bars, and other mechanical equipment, Panama Circular 1712.

The Albemarle Paper Co., Tredegar Street, Richmond, Va., has filed plans for extensions and improvements in its mill, including additional equipment, to cost \$75,000.

The Thomasville Iron Works, Inc., Thomasville, Ga., manufacturer of cane mills, wheel presses, etc., has plans for a one-story foundry 80 x 100 ft. It is proposed to double the capacity of this department of the plant. C. L. Thompson is president and general manager.

The Southern Power Co., Charlotte, N. C., is completing plans for its proposed steam-operated electric generating station on the Yadkin River, near Salisbury, N. C., with initial capacity of 75,000 kw., and will soon begin work. W. S. Lee is vice-president and chief engineer.

The Norfolk & Western Railway Co., Roanoke, Va., is said to be planning the construction of a new engine house with repair facilities in the East End district, Bristol, Va.

The City Council, Salisbury, N. C., is said to plan the installation of pumping machinery and auxiliary equipment in connection with proposed extensions in the municipal waterworks. Bonds for \$295,000 are being arranged for this and other improvements.

W. T. Candler, Candler Building, Atlanta, Ga., will proceed with the construction of a new automobile service, repair and garage building to cost about \$250,000 with equipment.

The National Rosin, Oil & Size Co., Exley Avenue, Savannah, Ga., has tentative plans for the rebuilding of the portion of its mill recently destroyed by fire, to include the installation of additional equipment.

The R. S. Armstrong & Brother Co., Atlanta, Ga., machinery dealer, has inquiries out for a 100-hp. motor, three-phase, 60-cycle, slip ring type.

The Southern Timber & Lumber Mills, Peters Building, Atlanta, Ga., is planning the purchase of saw mill machinery and accessory equipment.

The Moore Lumber Co., Culverton, Ga., is planning the purchase of pumping equipment for installation in the power house at its mill.

The Building Committee of the Board of Trustees, North Carolina State College, Raleigh, N. C., will soon begin the erection of a two-story electrical engineering building and laboratory, 61 x 190 ft., with wing extension, 60 x 80 ft., to cost about \$180,000. The installation will include generator, motors, switchboard apparatus, testing machinery, etc. Hobart Upjohn, Grand Central Terminal, New York, is architect.

T. C. Cox, head of the F. Cox Co., Asheville, N. C., has tentative plans for a three-story automobile service, repair and garage building, 130 x 140 ft., to cost \$200,000 with equipment.

The McIntosh Mills, Inc., Newnan, Ga., will build an electric power plant at its proposed local cotton yarn mill. The entire project will cost about \$100,000. Robert & Co., Inc., Bona-Alten Building, Atlanta, Ga., is architect and engineer. T. G. Farmer is president.

The Bureau of Yards and Docks, Navy Department, Washington, is asking bids until Dec. 16 for diamond mesh wire fencing, posts, rails, spearheads, etc., for fences and gates at the naval operating base, Pearl Harbor, T. H., specification 5147.

The Hackley Morrison Co., 1708 Lewis Street, Richmond, Va., machinery dealer, has inquiries out for an electric-operated centrifugal pump, with capacity of 400 to 500 gal. per min.

The Seminole Power Co., Bainbridge, Ga., is planning for extensions and improvements in its local steam-operated power house, recently secured from the city, and for similar work at its power plant at Spring Creek, Ga., including the installation of additional machinery.

Chicago

CHICAGO, Dec. 7.

A DECEMBER lull in machine-tool buying is apparently settling over the Chicago market. Dealers report that actual purchases are not as heavy as in previous weeks, but that sustained interest is indicated by the number of new inquiries coming out from day to day. Machine-tool users are carefully scanning their balance sheets and wherever possible purchases are being deferred so that charges against capital expense for new equipment will be carried on the 1926 books. The delivery situation is substantially unchanged and prices are said to be the same except on one line of milling machines which has been advanced 5 per cent.

The Yellow Sleeve Valve Engine Co., East Moline, Ill., has bought three eccentric grinders, four milling machines, two turret lathes, a multiple spindle drill, a 26-in. x 10-ft. special lathe, a 17-in. x 6-ft. lathe, an 11-in. x 5-ft. lathe, and a miscellaneous lot of used tools. The Hercules Corporation, Evansville, Ind., has purchased two hydraulic crank pin grinders, several automatic screw machines, two hydraulic presses, a number of hand presses and lathe equipment. The Youngstown Sheet & Tube Co. has closed for two roll grinders and a 25-in. drill press for its Indiana Harbor, Ind., plant. The International Harvester Co. has contracted for two high speed drills and is said to be closing this week on a number of heavy machine tools. The Nash Motors Co., Kenosha, Wis., is considering the purchase of additional tool room equipment. The Bucyrus Co., Milwaukee, is taking prices on a heavy boring mill, and the A. O. Smith Corporation, Milwaukee, is in the market for lathes, drill presses and several special machines. The Santa Fe is closing on a few tools for its Topeka, Kan., shops and the Chicago & North Western is inquiring for a 20-in. water tool grinder. The Great Northern will take bids this week on a driving wheel lathe, a hydraulic bushing press and a car wheel borer.

Reports are current in this market that the Chrysler Motor Corporation placed in Detroit about \$100,000 worth of cylindrical hydraulic grinders and crank shaft equipment.

The Wittenmeier Machinery Co., 850 North Spaulding Avenue, Chicago, will build a one-story brick shop, 37 x 102 ft., at 853 Christiana Avenue. R. Hockmuth & Co., 1930 Orchard Street, Chicago, are the general contractors.

The Commonwealth Edison Co., 72 West Adams Street, Chicago, will build a two-story switch house, 35 x 223 ft.,

to cost \$375,000. The general contractor is the J. W. Snyder Co., 307 North Michigan Avenue, Chicago.

The Paris Garter Co., 1131 West Congress Street, Chicago, will build a five-story, reinforced concrete, factory addition, 113 x 157 ft., to cost \$500,000. Alfred S. Alschuler, 28 East Jackson Boulevard, Chicago, is receiving bids.

The Consolidated Stone Co., Davenport, Iowa, has purchased a factory site on Rockingham Road, where it contemplates the erection of a stone finishing plant to cost \$30,000.

The Water Works Department, city of Evanston, Ill., contemplates installation of two 10,000,000-gal. centrifugal pumps for low head work. A. W. Hanford is commissioner of public works.

The National Biscuit Co., Evanston, Ill., contemplates the construction of a new power house at its general shop. Plans and specifications are being prepared at the New York offices of the company.

The Dale Valve Co., 1923 Carroll Avenue, Chicago, has filed plans for a three-story addition, 120 x 123 ft., to cost \$65,000. Joseph C. Llewellyn, 38 South Dearborn Street, is architect. Andrew R. Dale is president.

The Gopher Stone Co., 1500 Johnson Street, Minneapolis, Minn., has plans for an addition to its stone crushing plant, with the installation of additional machinery. C. J. Bard, National Building, is architect.

C. H. Johnston, 715 Capital Bank Building, St. Paul, Minn., architect, will take bids early in January for a two-story and basement automobile service, repair and garage building, 140 x 170 ft., to cost \$100,000, with equipment.

The Automatic Vehicle Tag Co., 348 South Robert Street, St. Paul, Minn., has rejected bids recently received for a new plant for the manufacture of metal specialties, and will ask new bids in the near future. It will be one-story and basement, 50 x 117 ft. George A. Blewett, Endicott Building, is architect. C. J. Sersen is president.

The Marshalltown Mfg. Co., 810 Nevada Street, Marshalltown, Iowa, manufacturer of presses, shearing machinery, etc., is considering a three-story addition to its plant, 60 x 75 ft., for which it is expected to ask bids early in the coming year. F. M. Farber is secretary and general manager.

The Automatic Gravel Products Co., Muscatine, Iowa, will rebuild the portion of its plant recently destroyed by fire, with loss estimated at \$100,000, including equipment.

The City Council, Madison, Minn., plans the installation of pumping machinery in connection with proposed extensions and improvements in the municipal waterworks, to cost about \$35,000. M. T. Hoff is city clerk.

The Abbott Laboratories, Inc., 4757 Ravenswood Avenue, Chicago, manufacturer of industrial chemicals, etc., will rebuild the portion of its plant destroyed by fire Nov. 27, with loss estimated at \$100,000, including equipment.

Jacob E. Decker & Sons, Mason City, Iowa, will proceed with the construction of a new cold storage and refrigerating plant on local site, to cost about \$100,000 with machinery.

The Peoples Ice & Cold Storage Co., Omaha, Neb., will construct a two-story addition to its plant at an estimated cost, including machinery, of \$100,000.

Buffalo

BUFFALO, Dec. 7.

THE Mohawk Power Co., Rochester, N. Y., operating the Rochester Gas & Electric Corporation and other utility properties, has plans for a power dam and hydroelectric generating plant at Canadea, Allegheny County, on the Genesee River, to cost \$2,000,000. The project will be carried out by the Canadea Power Co., a subsidiary. The Rochester Gas & Electric Corporation has acquired the property, including electric plant and system, of the Genesee Gas Light Co., Genesee, N. Y., and plans extensions and improvements in this district. Herman Russell is vice-president and general manager.

The Swan-Finch Oil Corporation, Jackson Building, Buffalo, contemplates making extensions in its storage and distributing plant at Manitoba Street and Scoville Avenue, including the installation of additional equipment.

H. S. Campbell, 89 Tioga Street, Buffalo, plans the establishment of a machine and repair shop for automobile work, and will purchase equipment at an early date.

Bids will be received by the Department of Public Works, Buffalo, until Dec. 15, for ten 5-ton tractors, two 5-ton caterpillar tractors, and two combination snow plows and

dump bodies, for the bureau of streets. William F. Schwartz is commissioner.

The Sodus Gas & Electric Light Co., Sodus, N. Y., is disposing of a bond issue of \$500,000, a portion of the proceeds to be used for extensions and improvements in plant and system.

The Buffalo Terminal Electric Co., Electric Building, Buffalo, has plans for a new electric terminal on Bailey Avenue, near the line of the New York Central Railroad, with main building, 27 x 150 ft. The entire project will cost \$1,500,000, including equipment. Charles R. Huntley is chairman of the board.

The Common Council, Akron, N. Y., is said to be planning the installation of pumping machinery in connection with a proposed sewage system to cost \$150,000.

F. L. Carlisle & Co., Inc., 49 Wall Street, New York, has acquired a controlling interest in the Peoples Gas & Electric Co., Oswego, N. Y., and plan extensions and improvements. It will be operated by a subsidiary organization. Work has been started on a 22,000-hp. hydroelectric generating plant, in this section.

C. W. Hughes, 106 West Sawyer Place, Rochester, is reported to be in the market for an electrically operated wood planer and other woodworking equipment.

The DeLaven Box Corporation, Seneca Falls, N. Y., recently organized by D. H. DeLaven and associates, will acquire a local factory for the manufacture of pasteboard box products. Transmission and conveying equipment will be required.

The E. M. Hause Battery & Electrical Service Corporation, 16 Fenton Place, Jamestown, N. Y., E. M. Hause, general manager, has acquired a four-story and basement garage and service building on West Fourth Street, and will remodel it for automotive, radio and general electrical repair and service work. Lathes, drill presses, air compressors and other equipment will be required.

Frank Tronalone, 911-913 Fillmore Street, Buffalo, is in the market for an air compressor, small cylinder regrinding machine and other equipment for a proposed garage and service station.

Cleveland

December 7, 1925.

MACHINE-TOOL business is holding up in fair volume, although inquiry has fallen off somewhat, which indicates the beginning of the lull that usually appears before the holiday season. The National Acme Co., during the week, booked an order for 25 automatic screw machines from a Dayton company which has recently been purchasing considerable equipment. The Oakland Motor Car Corporation, Pontiac, Mich., which has a large expansion program, continues to buy equipment and its orders the past week included several multiple spindle drilling and boring machines. The Lakewood Engineering Co., Cleveland, purchased a 5-ft. Carlton radial drill and is in the market for three or four other machines.

Steiner Brothers, Lima, Ohio, designing and manufacturing engineers of tools, dies, special machinery, etc., recently purchased two shapers, two lathes, two surface grinders, one universal grinding machine, one vertical shaper, two drill presses and one double deck heat treating furnace.

A four-story building, 100 x 200 ft., of the Upson bolt and nut works of the Bourne-Fuller Co., Cleveland, was destroyed by fire the past week. The first floor was equipped with cold heading machines which were salvaged, but 50 per cent or more of the machinery on the upper floors, mostly small bolt threading machines, was a total loss. The structure will be replaced as part of the rebuilding program which is now under way.

The National Steel Barrel Co., 3860 East Ninety-first Street, Cleveland, has awarded a general contract to the Boldt-Rapp Construction Co., for a one-story factory, 62 x 183 ft. Charles F. Shriner is president.

The Akron Standard Mold Machine Co., 1624 Englewood Avenue, Akron, Ohio, has placed contract with J. W. Costigan, Akron, for a one-story factory, 60 x 68 ft. A. J. Fleitle is general manager.

The Ford Motor Co., Detroit, has taken bids for an 80 x 85 ft. airplane hangar to be erected at the Cleveland Municipal Airport. Albert Kahn, 1004 Marquette Building, Detroit, is the architect and engineer.

The Eaton Axle & Spring Co., Cleveland, has placed a general contract with the Sam W. Emerson Co., for a

one-story factory extension, 80 x 150 ft., at its 140th Street plant. The Forest City Structural Steel Co., has the contract for the structural steel.

The Willys-Overland Co., Toledo, Ohio, has awarded a general contract to H. J. Spelker & Co., Toledo, for a one-story press shop, 51 x 620 ft.

Cincinnati

CINCINNATI, Dec. 7.

ALTHOUGH no large individual orders for machine tools have been placed the past week, total sales reached liberal proportions and many manufacturers report new business on a par with that in November. Automobile builders are less active in making purchases and it is not likely that they will buy on an extensive scale until after the first of the year. Railroads, aside from the Norfolk & Western, are negligible factors in the market. The usual seasonal decline in plant operations as the holidays approach is not expected this year. Many shops, including several of the more important machine tool builders, are running over-time to fill orders which have accumulated in the past month. Deliveries on most types of machines average six to eight weeks.

Inquiries are brisk and indications point to substantial buying of equipment the latter part of December. Included in the tools that industrial consumers expect to purchase are several unusually large machines.

Many railroad and industrial executives attended the machine tool exhibit of the Niles-Bement-Pond Co. at Hamilton, Ohio, on Dec. 1 and also visited local plants the past week. The Norfolk & Western has bought considerable of the equipment on its list and will purchase lathes, drills, a planer and several small tools the coming week. The Louisville & Nashville is taking bids until Dec. 10 on three 16-in. portable lathes, while the Florida East Coast Railroad, which has an inquiry out for several lathes and drills, is not expected to buy until next month.

The Buick Motor Co., Flint, Mich., which has purchased 20 lathes locally in the past month, bought three multi-cut lathes the past week. The Yellow Sleeve Valve Mfg. Co., East Moline, Ill., has taken four large lathes, including a crankshaft lathe, and the International Harvester Co., Chicago, bought two lathes. A local builder sold a large lathe to the Youngstown Sheet & Tube Co. for its Indiana Harbor plant. The William Cramp & Sons Ship & Engine Building Co., Philadelphia, ordered an extension bed gap lathe from a Cincinnati manufacturer who booked a similar machine for Jersey City delivery. Two Eastern industrial concerns each bought an extension bed gap lathe.

The McKinney Steel Co., Cleveland, purchased a 36-in. x 17-ft. heavy all-gear engine lathe from the Niles-Bement-Pond Co. The latter booked two 6-ft. right line radial drills for the Ingersoll-Rand Co., Phillipsburg, N. J. The Norfolk & Western Railroad bought a large railroad shaper from a local builder. The John Steptoe Co. sold a 24-in. motor-driven shaper in Memphis, Tenn., a 16-in. shaper in Philadelphia and a similar machine in Richmond, Va. A local turret lathe builder received orders for three machines from malleable iron companies. A Cincinnati machine tool manufacturer is the purchaser of two turret lathes from a Wisconsin builder. The Herring-Hall-Marvin Safe Co., Hamilton, Ohio, bought a straightening roll, and a local company purchased a jig borer. Another Cincinnati concern bought a Pratt & Whitney tool-room lathe.

The Norwood Engineering Co., manufacturer of tools, dies and vacuum rotors, has leased 5000 sq. ft. in the Norwood Power Building, Norwood and Fifth Streets, Dayton, Ohio. W. M. Haben is president.

The Lang Tool Co., 105 Perrine Street, Dayton, Ohio, manufacturer of sleeper grips, has moved to Norwood and Fifth Streets, Dayton, where it will double its production.

The Ohmer Fare Register Co., Dayton, Ohio, is reported to be contemplating the construction of an addition to cost \$50,000. John F. Ohmer is president.

The Delco Light Co., Dayton, Ohio, has awarded contract to H. H. Rupe, Dayton, for an addition to its plant to cost \$4,000.

The Board of Education, Cincinnati, plans the installation of manual training equipment in its proposed four-story Western Hills high school at Bridgetown Pike and Ferguson Road to cost \$1,000,000, for which plans have been filed. Garber & Woodward, Cincinnati, are architects.

The Eastern Machinery Co., 408 East Pearl Street, Cincinnati, has inquiries out for a gear hobber, vertical milling machine, draw-cut shaper, 36-in. swing lathe, with bed from 14 to 20 ft., and other equipment.

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Gulf States

BIRMINGHAM, Dec. 7.

THE Morgan Warehousing Co., Houston, Tex., has work nearing completion on the first two units of its plant at Houston and Carruth Streets, each four-stories, to be used as a cold storage and refrigerating plant, and for storage and distributing service. Other buildings will be erected next year. The entire project will cost approximately \$1,000,000.

The Colorado Ice Co., Colorado, Tex., is arranging for the erection of a one-story ice-manufacturing and cold storage plant to cost \$85,000. L. J. Geer is head.

The Southern Gas Co., San Antonio, Tex., operating natural gas properties, has arranged for a bond issue of \$3,000,000, a portion of the proceeds to be used for extensions and improvements, including the installation of additional equipment. L. J. Snyder is president.

The Star Brick & Tile Co., Inc., 610 East Quincy Street, San Antonio, Tex., recently reorganized with a capital of \$150,000, will make improvements in its plant, including the installation of additional brick machinery and other equipment, and parts replacement. A. S. Busby heads the company.

The Fort Worth & Denver City Railroad Co., Fort Worth, Tex., is considering rebuilding the portion of its car shops at Childress, Tex., recently destroyed by fire with loss estimated at \$40,000.

The Eastern Texas Electric Co., Beaumont, Tex., is arranging for a note issue to total \$3,500,000 and common stock issue for \$883,000, the proceeds to be used in part for a construction and improvement program, including expansion in power plants and additional equipment.

The City Council, Lucedale, Miss., plans the enlargement of its municipal electric light and power plant and the installation of additional machinery. New equipment will also be installed at the municipal waterworks.

The M. & H. Valve Co., Atlanta, Ga., J. W. Conway, president, has awarded a general contract to the Ogletree Construction Co., Anniston, Ala., for a one-story foundry and finishing plant, 100 x 390 ft., to cost \$75,000. A site was acquired recently at Twenty-second and Railroad Streets. The J. E. Serrine Co., Greenville, S. C., is architect and engineer.

The Texas & Pacific Railroad Co., Dallas, Tex., plans the rebuilding of its pumping station at Loraine, Tex., recently partially destroyed by fire, with loss reported at \$21,000 including equipment.

The Vernon Electric & Ice Co., Vernon, Tex., is said to be planning the construction of a new ice-manufacturing and cold storage plant to cost about \$200,000 with machinery. It is also purposed to remodel and improve the present power plant, providing additional equipment.

The Alabama Power Co., Birmingham, has work under way on a new power dam on the Alabama River, near Cherokee Bluffs, Ala., to form an artificial lake on a 40,000-acre tract, to impound 530,000,000 gal. of water. The project will include a hydroelectric generating plant, with capacity of 180,000 hp., and will cost more than \$10,000,000 with transmission system.

Dillingham & Alexander, Breckenridge, Tex., are said to be arranging for the construction of a new ice-manufacturing plant at Colorado, Tex., to cost \$75,000 with equipment.

The River Falls Power Co., River Falls, Ala., is planning the construction of a third hydroelectric power plant near Gantt, Ala., to be known as the O'Neal station, with initial capacity of 7500 hp. Work on a second hydroelectric power development is now under construction, to be ready for service early in 1926. The Southern Engineering Co., Albany, Ga., is engineer.

The Tampa Arctic Ice Co., Bruen & Webb Building, Tampa, Fla., is arranging to purchase equipment for installation in a local plant, including ice-making machinery, three motor-driven cranes, conveying machinery, and accessory equipment. R. A. Buford, Jr., is president.

The Anderson Mfg. Co., 803 North Congress Street, Jackson, Miss., recently organized under Delaware laws, plans the early construction of a new furniture factory in the Industrial Heights section, where a 12-acre tract has been secured. It will cost about \$100,000 with machinery. H. L. Rouff is president.

The Board of Trustees, State Orphans' Home, Corsicana, Tex., has plans for a one-story machine shop at the institution, in connection with an addition to the mechanical laundry, to cost \$21,000 with equipment.

St. Louis

ST. LOUIS, Dec. 7.

CONTRACT has been let by the Standard Underground Cable Co., Arcade Building, St. Louis, for a two-story addition to its plant at Silvia Avenue and the Kingshighway, 50 x 90 ft., to cost \$40,000. The Widmer Engineering Co., Laclede Gas Building, is engineer. Headquarters are at Seventeenth and Pike Streets, Pittsburgh.

The Electric Public Service Co., Bristow, Okla., has arranged a note issue to total \$1,000,000, a portion of the fund to be used for extensions and betterments in power plants and system. R. A. Pratt is president.

The Farber Fire Brick Co., Vandalia, Mo., operated by the Dover Fire Brick Co., Superior Avenue, Cleveland, is said to be arranging for the early rebuilding of the portion of its plant destroyed by fire Nov. 25, with loss estimated at \$200,000 including machinery.

The Norman Milling & Grain Co., Norman, Okla., is completing plans for enlargements and improvements in its ice-manufacturing plant, including the installation of additional machinery, to cost \$55,000. J. W. Stansel is superintendent.

The Liberty Foundry Co., 7600 Vulcan Street, St. Louis, manufacturer of iron and steel castings, has awarded a general contract to the Austin Co., Chicago, for a two-story addition, 32 x 90 ft., to cost \$40,000.

The Southwestern Sash & Door Co., B Street and Maiden Lane, Joplin, Mo., has awarded a general contract to George W. Miller, 1007 Prospect Avenue, for rebuilding the portion of its plant recently destroyed by fire, to be one-story, 100 x 200 ft., and to cost \$65,000 with equipment.

The St. Louis & Southwestern Railroad Co., St. Louis, is reported to be planning extensions and betterments in its car and locomotive shops at Pine Bluff, Ark., including new buildings and equipment, to cost \$125,000. W. S. Handley, Tyler, Tex., is chief engineer.

The Ward Chemical Co., Atco Building, Tulsa, Okla., is planning for the purchase of a ball mill, crucibles, electric motor and other equipment for installation in its proposed plant. William V. Ward, president, is in charge.

The Board of Education, Lexington, Mo., plans the installation of manual training equipment in its proposed new high school to cost \$200,000. J. H. Felt & Co., 300 West Forty-seventh Street, Kansas City, Mo., are architects.

The Coleman Lamp Co., Wichita, Kan., will soon begin the construction of a four-story and basement plant, 60 x 130 ft., to cost \$120,000 with machinery.

The Nebraska Power Co., Omaha, Neb., has made application to dispose of stock for \$900,000, the proceeds to be used for a proposed hydroelectric power development at Spencer, Neb., on the Niobrara River. The power station and machinery will cost \$500,000.

Detroit

DETROIT, Dec. 7.

TENTATIVE plans are being considered by the Grand Trunk Railway System, 400 East Jefferson Street, Detroit, for a one-story engine house and machine shop at Pontiac, Mich., to cost \$50,000. J. A. Heaman is chief engineer.

The Metal Office Furniture Co., Grand Rapids, Mich., has awarded a general contract to the John McNabb Co., Grand Rapids, for a three-story addition to cost \$70,000 with equipment.

The Cadillac Motor Car Co., Scotten Avenue, Detroit, will break ground for a new one-story assembling plant, 125 x 750 ft., to cost close to \$550,000 with equipment. A new administration building will also be built, and the space now occupied in the present plant by such department will be given over to manufacture as soon as the structure is completed. Albert Kahn, Inc., Marquette Building, is architect and engineer.

The Detroit Insulated Wire Co., Detroit, has awarded a general contract to the Austin Co., Chicago, for a one-story and basement addition, 30 x 40 ft., with extension, 20 x 60 ft., to cost \$30,000.

The Monroe Auto Equipment & Mfg. Co., Monroe, Mich., has filed plans for a one-story plant, 110 x 175 ft., to cost \$25,000.

The Muskegon Power & Light Co., Muskegon, Mich., will proceed with the construction of a hydroelectric power project on the Muskegon River, near Paris Township, to cost \$500,000 with equipment.

The Triangle Tool & Pattern Co., 207 Brady Avenue, Detroit, has awarded a general contract to F. M. Stokes, 6432 Northfield Avenue, for a one and two-story plant, 50 x 100 ft., to cost \$30,000. Janke, Verman & Kreke, Broadway Central Building, are architects.

The Michigan Sheet Metal Works, Inc., Lansing, Mich., has construction under way on a new plant unit for large increase in output. Additional machinery will be installed.

The Almont Mfg. Co., Almont, Mich., manufacturer of metal products, castings, etc., has concluded negotiations for property at Imlay City, Mich., and will remove its works to this place. Work will begin on a one-story foundry at once, to be followed by other structures. The present capacity will be increased.

The Detroit Edison Co., Detroit, is planning for extensions and improvements in its power plant at Bunce Creek, near Port Huron, Mich., to cost \$1,000,000 with equipment. The company plans for the early rebuilding of the portion of its Argo power station, Ann Arbor, Mich., destroyed by fire Nov. 24, with loss of \$40,000.

The Enterprise Brass Works, Muskegon, Mich., is completing plans for an addition, reported to cost \$22,000, with equipment.

Pittsburgh

PITTSBURGH, Dec. 7.

THE beginning of distribution of orders by the Norfolk & Western Railroad against its list is the outstanding feature of the week. On the whole the market is quiet, but considerable business is pending and inquiries are fairly numerous. Buyers are showing a disposition to conserve expenditures until after the first of the year.

A preferred stock issue of \$4,850,000 is being sold by the West Penn Power Co., West Penn Building, Pittsburgh, a considerable portion of the proceeds to be used for extensions and improvements in power plants and system.

Fire, Nov. 30, destroyed a number of buildings at the plant of the Harbison-Walker Refractories Co., Farmers' Bank Building, Pittsburgh, at Layton, Pa.

The Board of Education, Johnstown, Pa., plans the installation of manual training equipment in its proposed four-story and basement Garfield junior high school to cost \$750,000, for which bids have been asked on general contract. J. E. Adams, Nemo Building, is architect.

The United States Engineer, Huntington, W. Va., will receive bids until Dec. 14 for four pneumatic riveting hammers and four pneumatic pacing breakers, circular 65; until Dec. 15 for one 3000-gal. capacity cylindrical oil storage tank with accessory apparatus, circular 67, and until Dec. 16 for 5 dozen carborundum grinding wheels, circular 68.

The Guyan Machine Shops, Logan, W. Va., machinery dealers, have inquiries out for ovens, about 48 x 60 in., and 7 ft. long, for use with natural gas fuel to a temperature of 200 deg. Fahr.

Plans are being arranged for a reorganization of the Mountain State Window Glass Co., Manning, W. Va., and the operation of the local plant on an increased basis for the manufacture of sheet glass products. R. M. Alder heads the new interests.

The Board of Education, Wilkes-Barre, Pa., plans the installation of manual training equipment in a proposed two-story and basement junior and senior high school to replace a structure recently destroyed by fire. It is estimated to cost \$200,000. Rasmussen & Weyland, 36 West Forty-seventh Street, New York, are architects. William H. Dusenbury, 1834 Broadway, New York, is mechanical engineer.

The Robert Shaw Co., Greensburg, Pa., operating a mechanical works, has begun the erection of a new one-story machine shop to give employment to about 100 additional men.

John McCoy, Milesburg, Pa., owner of the McCoy & Linn furnace, will demolish the plant and use the site

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THE Morgan Warehousing Co., Houston, Tex., has work nearing completion on the first two units of its plant at Houston and Carruth Streets, each four-stories, to be used as a cold storage and refrigerating plant, and for storage and distributing service. Other buildings will be erected next year. The entire project will cost approximately \$1,000,000.

The Colorado Ice Co., Colorado, Tex., is arranging for the erection of a one-story ice-manufacturing and cold storage plant to cost \$85,000. L. J. Geer is head.

The Southern Gas Co., San Antonio, Tex., operating natural gas properties, has arranged for a bond issue of \$3,000,000, a portion of the proceeds to be used for extensions and improvements, including the installation of additional equipment. L. J. Snyder is president.

The Star Brick & Tile Co., Inc., 610 East Quincy Street, San Antonio, Tex., recently reorganized with a capital of \$150,000, will make improvements in its plant, including the installation of additional brick machinery and other equipment, and parts replacement. A. S. Busby heads the company.

The Fort Worth & Denver City Railroad Co., Fort Worth, Tex., is considering rebuilding the portion of its car shops at Childress, Tex., recently destroyed by fire with loss estimated at \$40,000.

The Eastern Texas Electric Co., Beaumont, Tex., is arranging for a note issue to total \$3,500,000 and common stock issue for \$883,000, the proceeds to be used in part for a construction and improvement program, including expansion in power plants and additional equipment.

The City Council, Lucedale, Miss., plans the enlargement of its municipal electric light and power plant and the installation of additional machinery. New equipment will also be installed at the municipal waterworks.

The M. & H. Valve Co., Atlanta, Ga., J. W. Conway, president, has awarded a general contract to the Ogletree Construction Co., Anniston, Ala., for a one-story foundry and finishing plant, 100 x 390 ft., to cost \$75,000. A site was acquired recently at Twenty-second and Railroad Streets. The J. E. Sirrine Co., Greenville, S. C., is architect and engineer.

The Texas & Pacific Railroad Co., Dallas, Tex., plans the rebuilding of its pumping station at Loraine, Tex., recently partially destroyed by fire, with loss reported at \$21,000 including equipment.

The Vernon Electric & Ice Co., Vernon, Tex., is said to be planning the construction of a new ice-manufacturing and cold storage plant to cost about \$200,000 with machinery. It is also purposed to remodel and improve the present power plant, providing additional equipment.

The Alabama Power Co., Birmingham, has work under way on a new power dam on the Alabama River, near Cherokee Bluffs, Ala., to form an artificial lake on a 40,000-acre tract, to impound 530,000,000 gal. of water. The project will include a hydroelectric generating plant, with capacity of 180,000 hp., and will cost more than \$10,000,000 with transmission system.

Dillingham & Alexander, Breckenridge, Tex., are said to be arranging for the construction of a new ice-manufacturing plant at Colorado, Tex., to cost \$75,000 with equipment.

The River Falls Power Co., River Falls, Ala., is planning the construction of a third hydroelectric power plant near Gantt, Ala., to be known as the O'Neal station, with initial capacity of 7500 hp. Work on a second hydroelectric power development is now under construction, to be ready for service early in 1926. The Southern Engineering Co., Albany, Ga., is engineer.

The Tampa Arctic Ice Co., Bruen & Webb Building, Tampa, Fla., is arranging to purchase equipment for installation in a local plant, including ice-making machinery, three motor-driven cranes, conveying machinery, and accessory equipment. R. A. Buford, Jr., is president.

The Anderson Mfg. Co., 803 North Congress Street, Jackson, Miss., recently organized under Delaware laws, plans the early construction of a new furniture factory in the Industrial Heights section, where a 12-acre tract has been secured. It will cost about \$100,000 with machinery. H. L. Rouff is president.

The Board of Trustees, State Orphans' Home, Corsicana, Tex., has plans for a one-story machine shop at the institution, in connection with an addition to the mechanical laundry, to cost \$21,000 with equipment.

St. Louis

ST. LOUIS, Dec. 7.

CONTRACT has been let by the Standard Underground Cable Co., Arcade Building, St. Louis, for a two-story addition to its plant at Silvia Avenue and the Kingshighway, 50 x 90 ft., to cost \$40,000. The Widmer Engineering Co., Laclede Gas Building, is engineer. Headquarters are at Seventeenth and Pike Streets, Pittsburgh.

The Electric Public Service Co., Bristow, Okla., has arranged a note issue to total \$1,000,000, a portion of the fund to be used for extensions and betterments in power plants and system. R. A. Pratt is president.

The Farber Fire Brick Co., Vandalia, Mo., operated by the Dover Fire Brick Co., Superior Avenue, Cleveland, is said to be arranging for the early rebuilding of the portion of its plant destroyed by fire Nov. 25, with loss estimated at \$200,000 including machinery.

The Norman Milling & Grain Co., Norman, Okla., is completing plans for enlargements and improvements in its ice-manufacturing plant, including the installation of additional machinery, to cost \$55,000. J. W. Stansel is superintendent.

The Liberty Foundry Co., 7600 Vulcan Street, St. Louis, manufacturer of iron and steel castings, has awarded a general contract to the Austin Co., Chicago, for a two-story addition, 32 x 90 ft., to cost \$40,000.

The Southwestern Sash & Door Co., B Street and Maiden Lane, Joplin, Mo., has awarded a general contract to George W. Miller, 1007 Prospect Avenue, for rebuilding the portion of its plant recently destroyed by fire, to be one-story, 100 x 200 ft., and to cost \$65,000 with equipment.

The St. Louis & Southwestern Railroad Co., St. Louis, is reported to be planning extensions and betterments in its car and locomotive shops at Pine Bluff, Ark., including new buildings and equipment, to cost \$125,000. W. S. Handley, Tyler, Tex., is chief engineer.

The Ward Chemical Co., Atco Building, Tulsa, Okla., is planning for the purchase of a ball mill, crucibles, electric motor and other equipment for installation in its proposed plant. William V. Ward, president, is in charge.

The Board of Education, Lexington, Mo., plans the installation of manual training equipment in its proposed new high school to cost \$200,000. J. H. Felt & Co., 300 West Forty-seventh Street, Kansas City, Mo., are architects.

The Coleman Lamp Co., Wichita, Kan., will soon begin the construction of a four-story and basement plant, 60 x 130 ft., to cost \$120,000 with machinery.

The Nebraska Power Co., Omaha, Neb., has made application to dispose of stock for \$900,000, the proceeds to be used for a proposed hydroelectric power development at Spencer, Neb., on the Niobrara River. The power station and machinery will cost \$500,000.

Detroit

DETROIT, Dec. 7.

TENTATIVE plans are being considered by the Grand Trunk Railway System, 400 East Jefferson Street, Detroit, for a one-story engine house and machine shop at Pontiac, Mich., to cost \$50,000. J. A. Heaman is chief engineer.

The Metal Office Furniture Co., Grand Rapids, Mich., has awarded a general contract to the John McNabb Co., Grand Rapids, for a three-story addition to cost \$70,000 with equipment.

The Cadillac Motor Car Co., Scotten Avenue, Detroit, will break ground for a new one-story assembling plant, 125 x 750 ft., to cost close to \$550,000 with equipment. A new administration building will also be built, and the space now occupied in the present plant by such department will be given over to manufacture as soon as the structure is completed. Albert Kahn, Inc., Marquette Building, is architect and engineer.

The Detroit Insulated Wire Co., Detroit, has awarded a general contract to the Austin Co., Chicago, for a one-story and basement addition, 30 x 40 ft., with extension, 20 x 60 ft., to cost \$30,000.

The Monroe Auto Equipment & Mfg. Co., Monroe, Mich., has filed plans for a one-story plant, 110 x 175 ft., to cost \$25,000.

The Muskegon Power & Light Co., Muskegon, Mich., will proceed with the construction of a hydroelectric power project on the Muskegon River, near Paris Township, to cost \$500,000 with equipment.

The Triangle Tool & Pattern Co., 207 Brady Avenue, Detroit, has awarded a general contract to F. M. Stokes, 6432 Northfield Avenue, for a one and two-story plant, 50 x 100 ft., to cost \$30,000. Janke, Verman & Kreke, Broadway Central Building, are architects.

The Michigan Sheet Metal Works, Inc., Lansing, Mich., has construction under way on a new plant unit for large increase in output. Additional machinery will be installed.

The Almont Mfg. Co., Almont, Mich., manufacturer of metal products, castings, etc., has concluded negotiations for property at Imlay City, Mich., and will remove its works to this place. Work will begin on a one-story foundry at once, to be followed by other structures. The present capacity will be increased.

The Detroit Edison Co., Detroit, is planning for extensions and improvements in its power plant at Bunce Creek, near Port Huron, Mich., to cost \$1,000,000 with equipment. The company plans for the early rebuilding of the portion of its Argo power station, Ann Arbor, Mich., destroyed by fire Nov. 24, with loss of \$40,000.

The Enterprise Brass Works, Muskegon, Mich., is completing plans for an addition, reported to cost \$22,000, with equipment.

Pittsburgh

PITTSBURGH, Dec. 7.

THE beginning of distribution of orders by the Norfolk & Western Railroad against its list is the outstanding feature of the week. On the whole the market is quiet, but considerable business is pending and inquiries are fairly numerous. Buyers are showing a disposition to conserve expenditures until after the first of the year.

A preferred stock issue of \$4,850,000 is being sold by the West Penn Power Co., West Penn Building, Pittsburgh, a considerable portion of the proceeds to be used for extensions and improvements in power plants and system.

Fire, Nov. 30, destroyed a number of buildings at the plant of the Harbison-Walker Refractories Co., Farmers' Bank Building, Pittsburgh, at Layton, Pa.

The Board of Education, Johnstown, Pa., plans the installation of manual training equipment in its proposed four-story and basement Garfield junior high school to cost \$750,000, for which bids have been asked on general contract. J. E. Adams, Nemo Building, is architect.

The United States Engineer, Huntington, W. Va., will receive bids until Dec. 14 for four pneumatic riveting hammers and four pneumatic pacing breakers, circular 65; until Dec. 15 for one 3000-gal. capacity cylindrical oil storage tank with accessory apparatus, circular 67, and until Dec. 16 for 5 dozen carborundum grinding wheels, circular 68.

The Guyan Machine Shops, Logan, W. Va., machinery dealers, have inquiries out for ovens, about 48 x 60 in., and 7 ft. long, for use with natural gas fuel to a temperature of 200 deg. Fahr.

Plans are being arranged for a reorganization of the Mountain State Window Glass Co., Manning, W. Va., and the operation of the local plant on an increased basis for the manufacture of sheet glass products. R. M. Alder heads the new interests.

The Board of Education, Wilton, Pa., plans the installation of manual training equipment in a proposed two-story and basement junior and senior high school to replace a structure recently destroyed by fire. It is estimated to cost \$200,000. Rasmussen & Weyland, 36 West Forty-seventh Street, New York, are architects. William H. Dusenbury, 1834 Broadway, New York, is mechanical engineer.

The Robert Shaw Co., Greensburg, Pa., operating a mechanical works, has begun the erection of a new one-story machine shop to give employment to about 100 additional men.

John McCoy, Milesburg, Pa., owner of the McCoy & Linn furnace, will demolish the plant and use the site

for a hydroelectric power station. The initial installation will comprise a 350-hp. vertical water-wheel, 250-kw. generator and auxiliary equipment. The output of the plant will be taken by the Keystone Power Corporation, Ridgway, Pa.

The Richmond Radiator Co., Uniontown, Pa., has awarded a general contract to the Truscon Steel Co., Youngstown, Ohio, for five one-story additions, comprising foundry, 65 x 110 ft.; machine shop, 40 x 135 ft.; iron-enameling department, 22 x 170 ft.; testing department, 30 x 75 ft., and warehouse, 32 x 70 ft., to cost about \$60,000.

The Pittsburgh Tool Steel Wire Co., Monaco, Pa., is considering cold rolling machinery.

Indiana

INDIANAPOLIS, Dec. 7.

BIDS will be received by the Board of School Trustees, Wabash, Ind., until Dec. 16, for shop and commercial arts equipment, lockers, laboratory apparatus and other equipment for installation in the new high school. J. Edwin Kopf and Deery, 402 Indiana Pythian Building, Indianapolis, are architects. M. F. Jordan is secretary.

New interests, headed by William A. Falls, Detroit, have acquired the plant and property of the Barbee Wire & Iron Works, Inc., Lafayette, Ind., at a public sale, with price of \$125,500. Possession will be taken at once and improvements made. The company was placed in receivership on April 10, and has been running continuously since that time.

Graham Brothers, Inc., Evansville, Ind., manufacturer of motor trucks, parts, etc., has awarded a general contract to the M. J. Hoffman Construction Co., Furniture Building, for extensions and improvements, including remodeling the present plant on Stringtown Road, with additional equipment. The company was recently acquired by Dodge Brothers, Inc., Detroit.

The Citizens' Gas Co., Indianapolis, is planning for extensions in its artificial gas plant, with the erection of additions for the manufacture of sulphate of ammonia and kindred products. It will cost approximately \$350,000. C. L. Kirk is vice-president and general manager.

The Insley Mfg. Co., Olney and St. Clair Streets, Indianapolis, operating a steel fabricating plant, has plans for a one-story power house, with installation of two low pressure boilers and other equipment.

The Lewis Rim Co., Indianapolis, recently organized by James C. Lewis, has acquired the local factory formerly occupied by the Swartz Electric Co., and will remodel for the manufacture of a patented type automobile rim. A department will also be established for the production of automobile disk and wooden wheels. William T. Bailey, assistant city attorney, is interested in the organization.

The Dill Foundry Co., Rushville, Ind., will soon begin work on a proposed one-story foundry, 140 x 180 ft., to cost \$45,000 with equipment.

The Indianapolis Colitic Stone Co., 208 Hume Mansur Building, Indianapolis, is considering the erection of a mill at Stinesville, Ind., for grinding, polishing, etc., to cost \$30,000 with equipment. It is expected to begin work in the spring. C. H. Webb is vice-president.

The Faultless Caster Co., Garvin Street, Evansville, Ind., has awarded a general contract to the M. J. Hoffman Construction Co., Furniture Building, for a one-story addition, 50 x 125 ft., to cost \$22,000.

The Board of School Commissioners, 150 North Meridian Street, Indianapolis, plans the installation of manual training equipment in the proposed new Thomas Jefferson high school for colored students, to cost \$520,000, for which a general contract has been let to Brown & Mick, 296 East Michigan Street. Harrison & Turnock, Board of Trade Building, are architects.

G. D. Bassett, purchasing agent, Standard Forging Co., maker of axles and other forgings, Railway Exchange Building, Chicago, says there is no basis for the report appearing in this column in the issue of Nov. 19 respecting the plan of the company to build a foundry at Indiana Harbor.

Pacific Coast

SAN FRANCISCO, Dec. 2.

BIDS will soon be asked by the Herman Safe Co., 216 Fremont Street, San Francisco, for a one and two-story plant, 137 x 140 ft., to cost \$80,000, with equipment. T. Ronneberg, Crocker Building, is architect and engineer.

The municipal water and power commission, 207 South Broadway, Los Angeles, has rejected bids recently received for a Diesel engine generating set, and expects to ask new bids at an early date.

The Thomas Paper Converting Co., Los Angeles, has awarded contract to the Austin Co., for a one and two-story plant, 100 x 150 ft., to cost about \$85,000 with equipment.

The Soda Potash Products Co., care of the Union Engineering Co., Bartlett Building, Los Angeles, will soon begin the erection of a plant at Riverside, Cal., consisting of ten one-story units, each 95 x 200 ft., to cost \$900,000 with machinery.

The Prentice Packing & Cold Storage Co., Yakima, Wash., plans the construction of a new cold storage and refrigerating plant to cost \$65,000 with machinery.

The Northwestern Electric Co., Portland, Ore., operating electric light and power utilities, has plans for a two-story and basement equipment storage, repair and distributing plant, 100 x 200 ft., to cost \$125,000. Martin Schacht, Yeon Building, is architect.

In connection with proposed harbor improvements at Oakland, Cal., for which a bond issue of \$9,960,000 is being arranged, the City Council, Oakland, plans the construction of a new cold storage and refrigerating plant to cost approximately \$300,000.

Dodge A. Riedy, Pacific Building, San Francisco, architect, will soon ask bids for a two-story automobile service, repair and garage building to cost \$100,000.

The Utah-Idaho Sugar Co., Salt Lake City, Utah, is reported to be planning the construction of a beet sugar mill in the vicinity of Willamette Valley, Ore., with power house, machine shop and other structures to cost \$1,000,000.

The International Derrick & Equipment Co., Torrance, Cal., manufacturer of oil well equipment, has filed plans for a new plant at 2410 Carson Street.

The Santee Garage Co., Los Angeles, has plans for a six-story service, repair and garage building, 100 x 160 ft., to cost \$350,000 with equipment. Burnett & Dodge, Lanarkshim Building, are architects.

The Art Iron Works, San Francisco, has removed from 1795 Union Street to a building at 574 Bryant Street, where additional equipment will be provided for increased capacity.

The General Petroleum Corporation, 310 Sansome Street, San Francisco, has acquired property at Fresno, Cal., and contemplates the early construction of a new storage and distributing plant to cost \$100,000. A repair and machine shop and garage, for company trucks will also be built.

Canada

TORONTO, Dec. 7.

INQUIRY for machine tools improved somewhat in the past week, a strong demand developing for single tools. Sales are chiefly for replacement, but some recent inquiries are for new works. According to dealers, the business outlook is much brighter than a year ago and the trade is of the opinion that the New Year will bring increased activity. The slowing down of the automotive industry has resulted in a falling off in demand from this source, but there is still a fair amount of buying on this account and inquiries are out for tools for a new plant under construction at Windsor.

The Chrysler Motor Co. of Canada, Windsor, Ont., which is erecting a plant, is interested in equipment and tools. J. D. Mansfield is manager.

Murray & Orr, Barry's Bay, Ont., are interested in the purchase of complete sawmill equipment.

The George B. Eddy Co., Bathurst, N. B., will replace its woodworking plant recently destroyed by fire with a main building, 66 x 112 ft., two and one-half stories, and a boiler house and engine room, 45 x 45 ft. A blower system and several small engines will be purchased.

W. H. Dwyer, Ltd., 42 St. Sacramento Street, Montreal, will build a garage and repair shop on De Gaspe Street and is interested in equipment. Hutchison & Wood, 86 Notre Dame Street West, are architects.

The Philip Gies Pump Co., Kitchener, Ont., has awarded general contract to Dunker Brothers, Louisa Street, for an addition. Machinery and tools will be required.

J. Grenier, East Beauport, Que., is in the market for a mortiser and tenoner machine for a sash and door factory.

H. Chagnow & C. Stee, 31 Barnett Street, Montreal, will purchase complete sawmill equipment, costing about \$75,000, to replace that recently destroyed by fire.

Church Ross, Ltd., Keefer Boulevard, Montreal, is building a garage to cost \$250,000.

P. Freres, 797 St. Christopher Street, Montreal, is in the market for a milling machine.

E. Scott, 734 St. Paul Street, Montreal, is in the market for miscellaneous tools for a machine shop.

I. Suffrin, 1218 St. Lawrence Street, Montreal, is in the market for lathe, planer, etc.

Bids will be called at the end of this month by R. S. & W. S. Lea, engineers, 340 University Street, Montreal, for a hydropower development plant at Coaticook, Que., to cost \$180,000.

The Department of Trade and Commerce, Ottawa, Ont., has received contract forms and specifications, file No. 29077, in connection with the following equipment for the Victorian Government, Australia, for use in connection with brown coal deposits at Morwell. Two turbo-generators developing approximately 7200 kva., and seven 2500 kva. single-phase transformers; one turbo-generator 4150 kva. and four 1400 kva. single-phase transformers; one turbo-generator 2850 kva. and four 1000 kva. single-phase transformers; two turbo-generators, 4750 kva. and seven 1833 kva. single-phase transformers; one turbo-generator 806 kva. and seven 3300 kva. single-phase transformers. Switchgear for the control of transformers and circuits and cranes suitable for handling the turbo-generators and transformers are also required. Tenders should be addressed to the secretary of the State Electric Commission of Victoria, Melbourne, Australia, and will be received until April 12.

Foreign

Bids are being asked by the Public Works Supplies and Tenders Committee, Wellington, New Zealand, until Jan. 26, for automatic oil switches, airbrake switches, insulators, lightning arresters, transformers and other electrical equipment for the Waikato and Lake Coleridge power schemes.

The Iwaya Refrigerating Co., Ichome Giza, Tokio, Japan, is planning for the installation of additional ice and refrigerating machinery and will make purchases of desired American-type equipment in the near future. Information is now being solicited.

The Edison General Italian Electric Co., Milan, Italy, is arranging for the sale of a bond issue in the United States to total \$10,000,000, a considerable portion of the fund to be used for extensions in power plants and system. J. E. Aldred, head of Aldred & Co., 42 Wall Street, New York, operating public utility properties, is interested in the project.

The Borough Council, Gisborne, New Zealand, W. H. Buswell, borough engineer, is asking bids, with no stated closing time, for electrical equipment for a municipal power plant, including Diesel engine, electric alternators, rotary converter, switchboard apparatus, etc. Specifications at the office of William Coward & Co., Ltd., 22 Buckingham Gate, London, S.W. 1, England.

The American Chamber of Commerce in France, 32 Rue Taitbout, Paris, has received an inquiry (K-3198), from a local company desiring to get in touch with American manufacturers of dredger buckets and bucket pins.

Industrial Finance

Net sales of the Columbia Steel Corporation, San Francisco, for the first half of 1925 are reported at \$5,513,250, compared with \$7,949,269 for all of 1924. Net operating income in six months of 1925 was \$753,849, against \$862,842 for 12 months of 1924. After interest and taxes, there remained \$406,277 in the first half of 1925, a rate nearly three times that of 1924 and considerably above that of 1923. Preferred dividend requirements are below the 1925 earnings.

Property of the Phoenix Iron Works Co., Meadville, Pa., will be sold at public auction on the company's premises Dec. 11, Samuel E. Duff receiver of the company, announces.

The Trumbull Steel Co., Warren, Ohio, reports satisfactory results from October operations. Net sales were \$2,761,713, while net earnings, after all charges, including interest and depreciation, were \$233,485. The company announces that it is working off low-priced tonnage and running into higher-priced business and its earnings position may therefore be expected to show improvement, provided current satisfactory business is sustained.

A considerable reduction in profits is shown in the annual financial statement of the Canadian Car & Foundry Co., Ltd., Montreal, Que., for the year ended Sept. 30. Profits for the year stood at \$256,388, as compared with \$1,928,312 in the preceding 12-month period. To the profits was added interest earned amounting to \$232,484, making a total of \$488,872. Deduction of depreciation at \$402,000 and interest at \$416,644 left a deficit of \$329,772, which was increased to \$854,772 with the payment of the regular dividends on the preferred stock, amounting to \$525,000. Surplus was thereby reduced to \$3,049,098, from which was deducted

\$383,750, being arrears on the preferred stock, paid during the year, leaving a balance of \$2,655,348.

The G. A. Schacht Motor Truck Co., Cincinnati, manufacturer of automobile trucks and passenger buses, has issued \$1,000,000 of 6 per cent three-year convertible gold notes, which have been purchased by W. E. Hutton & Co., Cincinnati brokers. Proceeds are to be added to the working capital of the company to care for its growing business. G. A. Schacht is president and R. K. LeBlond chairman of the board.

Crane Co., 836 South Michigan Avenue, Chicago, manufacturer of gas, steam and water fittings, reports sales of between 10 and 12 per cent in excess of 1924, when the company had a net income of \$8,800,868, equal to \$3.61 a share, on the common stock. Directors of the company this week placed the common stock on a 6 per cent basis by the declaration of a quarterly disbursement of 1½ per cent, comparing with 5 per cent paid last year.

The Interstate Iron & Steel Co., 104 South Michigan Boulevard, Chicago, Ill., reduced accrued dividends on the preferred stock to \$15.50 a share, with a dividend of 1½ per cent in addition to the regular quarterly 1¼ per cent disbursement.

The Blaw-Knox Co. has declared extra dividend of 4 per cent on the common stock, payable Dec. 24 to stockholders of record Dec. 12.

The reorganization committee and preferred stockholders' committee of the Hydraulic Steel Co., Cleveland, reached an agreement at a meeting in Philadelphia the past week which is expected to result in the lifting of the receivership and the sale of the plants of the Hydraulic company. Letters have been sent to the preferred stockholders informing them of the agreement and urging them to deposit their stock with the Guardian Trust Co., Cleveland. A petition for the sale of the company's plants has been filed in the Federal court, a hearing upon which has been set for Dec. 12. The reorganization committee has an offer for the West Side plant, formerly known as the Cleveland Welding Co., and an offer is expected for the East Side plants, one of which is engaged in the manufacture of automobile frames. The plants have been operated by Thomas B. Goodbody since Oct. 26, 1923, when the company was placed in receivership.

The Commerce Guardian Trust & Savings Bank, Toledo, receiver for the Clydesdale Motor Truck Co., has appointed the Industrial Plants Corporation, 25 Church Street, New York, professional liquidators, to sell the entire plant and equipment of the Clydesdale Motor Truck Co. at Clyde, Ohio. Up to Sept. 16 of this year, when the receiver was appointed, the Clydesdale company was turning out and selling trucks at the highest rate in eight years. The company occupies a modern plant at Clyde with 150,000 sq. ft. of floor space, which with machinery and inventory is appraised at more than \$750,000.

Trade Changes

The Ranson & Orr Co., Dixie Terminal Building, Cincinnati, has been appointed the exclusive pig iron and coke sales agent of the Sloss-Sheffield Steel & Iron Co., Birmingham, in western New York, western Pennsylvania, Ohio, southern Indiana, Michigan, Kentucky and part of West Virginia.

The Cleveland Automatic Machine Co. has opened a branch sales office in New York at 95 Liberty Street, with Lon W. Schafer in charge. This company has also just opened a branch sales office in Detroit at 1217 Book Building, with Bart C. Young in charge.

Branch Office Representatives of The Iron Age

Editorial

Chicago, Otis Bldg.....	R. A. Fiske
Pittsburgh, Park Bldg.....	G. F. Tegan
Cleveland, Guardian Bldg.....	F. L. Prentiss
Cincinnati, First National Bank Bldg.....	Burnham Finney
Boston, Park Square Bldg.....	Gerard Frazar
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Hartford, Conn., P. O. Box 81.....	D. C. Warren
Northern New Jersey, Hotel Regent, 98 Bleecker St., Newark, N. J.....	W. C. Sweetser
New York, 239 West Thirty-Ninth St., P. W. Schultz, C. L. Rice, H. Sinnock	
San Francisco, 320 Market St.....	W. A. Douglass

Current Metal Prices

On Small Lots, Delivered from Stocks, New York

THESE prices are given for the convenience of small-lot buyers whose requirements do not run into mill-size orders.

Only base prices can be listed in some cases, due to limits of space; other items of a given group are deducible from the base price.

The prices which are quoted below are those at which small lots may be bought, whether from jobbers' or other stocks.

Complete market reports and prices on large shipments from mills will be found elsewhere under "Iron and Steel Markets" and "Non-Ferrous Metals."

Bars, Shapes and Plates		Per Lb.
Bars:		
Refined iron bars, base price.....	3.24c.	
Swedish charcoal iron bars, base.....	7.00c. to 7.25c.	
Soft steel bars, base price.....	3.24c.	
Hoops, base price.....	4.49c.	
Bands, base price.....	3.99c.	
Beams and channels, angles and tees, 3 in. x ¼ in. and larger, base.....	3.34c.	
Channels, angles and tees under 3 in. x ¼ in. base.....	3.24c.	
Steel plates, ¼ in. and heavier.....	3.34c.	

Merchant Steel		Per Lb.
Tire, 1½ x ½ in. and larger.....	3.80c.	
(Smooth finish, 1 to 2½ x ¼ in. and larger)...	3.65c.	
Toe-calk, ½ x ¾ in. and larger.....	4.20c.	
Cold-rolled strip, soft and quarter hard.....	6.25c. to 6.75c.	
Open-hearth spring steel.....	4.50c. to 7.00c.	
Shafting and Screw Stock:		
Rounds and hex.....	4.00c.	
Squares and flats.....	4.50c.	
Standard tool steel, base price.....	12.00c.	
Extra tool steel.....	15.00c. to 18.00c.	
Special tool steel.....	20.00c. to 23.00c.	
High-speed steel, 18 per cent tungsten.....	70c.	

Sheets		Per Lb.
Blue Annealed		
No. 10.....	3.89c.	
No. 12.....	3.94c.	
No. 14.....	3.99c.	
No. 16.....	4.09c.	

Box Annealed—Black		Per Lb.
Soft Steel		Long Terne
C. R. One Pass		Sheets
Per Lb.		Per Lb.
Nos. 18 to 20.....	3.95c. to 4.10c.	5.75c.
Nos. 22 and 24.....	4.20c. to 4.35c.	5.90c.
No. 26.....	4.25c. to 4.40c.	6.05c.
No. 28*.....	4.35c. to 4.50c.	6.35c.
No. 30.....	4.55c. to 4.70c.	6.85c.

Galvanized		Per Lb.
No. 14.....	4.45c. to 4.60c.	
No. 16.....	4.60c. to 4.75c.	
Nos. 18 and 20.....	4.75c. to 4.90c.	
Nos. 22 and 24.....	4.90c. to 5.05c.	
No. 26.....	5.05c. to 5.20c.	
No. 28*.....	5.35c. to 5.50c.	
No. 30.....	5.85c. to 6.00c.	

*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

Standard Steel		Wrought Iron	
Black Galv.		Black Galv.	
½ in. Butt....	46 29	½ in. Butt....	4 +19
¾ in. Butt....	51 37	¾ in. Butt....	11 + 9
1-3 in. Butt....	53 39	1-1½ in. Butt	14 + 6
2½-6 in. Lap..	48 35	2-in. Lap....	5 +14
7 & 8 in. Lap..	44 17	3-6 in. Lap... 11	+ 6
11 & 12 in. Lap.	37 12	7-12 in. Lap... 3	+16

Bolts and Screws	
Machine bolts, cut thread, 40 and 10 per cent off list	
Carriage bolts, cut thread, 30 and 10 per cent off list	
Coach screws, 40 and 10 per cent off list	
Wood screws, flat head iron,	
80, 20, 10 and 5 per cent off list	

Steel Wire		Per Lb.
BASE PRICE† ON NO. 9 GAGE AND COARSER		
Bright, basic.....	4.25c.	
Annealed, soft.....	4.50c.	
Galvanized, annealed.....	5.15c.	
Coppered, basic.....	5.15c.	
Tinned, soft Bessemer.....	6.15c.	

†Regular extras for lighter gage.

Brass Sheet, Rod, Tube and Wire

BASE PRICE	
High brass sheet.....	19½c. to 20½c.
High brass wire.....	19½c. to 20½c.
Brass rods.....	17½c. to 18½c.
Brass tube, brazed.....	27½c. to 28½c.
Brass tube, seamless.....	24 c. to 25 c.
Copper tube, seamless.....	24½c. to 25½c.

Copper Sheets

Sheet copper, hot rolled, 22½c. to 23½c. per lb. base.

Cold rolled, 14 oz. and heavier, 3c. per lb. advance over hot rolled.

Tin Plates		Coke—14x20		Prime	Seconds
Bright Tin		Grade "AAA"		80 lb..	\$6.15 \$5.90
		Grade "A"		90 lb..	6.30 6.05
		Charcoal 14x20		100 lb..	6.45 6.20
IC..	\$11.25	Charcoal 14x20		IC..	6.65 6.40
IX..	12.85			IX..	7.85 7.60
IXX..	14.40			IXX..	9.00 8.75
IXXX..	15.75			IXXX..	10.35 10.10
IXXXX..	17.00			IXXXX..	11.35 11.10

Terne Plates

14 x 20	
IC—8-lb. coating.....	\$6.85 to \$7.75
IC—20-lb. coating.....	10.00 to 10.25
IC—30-lb. coating.....	11.75 to 12.00
IC—40-lb. coating.....	13.00 to 13.65
Fire-door stock.....	10.00

Tin	
Straits, pig.....	.65c. to 65½c.
Bar.....	.69c. to 69½c.

Copper	
Lake ingot.....	15 c.
Electrolytic.....	14½c.
Casting.....	14½c.

Spelter and Sheet Zinc	
Western spelter.....	9½c. to 10c.
Sheet zinc, No. 9 base, casks.....	13½c.; open, 13½c.

Lead and Solder*	
American pig lead.....	10½c. to 12½c.
Bar lead.....	12½c. to 13½c.
Solder, ½ and ½ guaranteed.....	40½c.
No. 1 solder.....	37½c.
Refined solder.....	30½c.

*Prices of solder indicated by private brand vary according to composition.

Babbitt Metal	
Best grade, per lb.....	.68c. to 72c.
Commercial grade, per lb.....	.30c. to 35c.

Antimony	
Asiatic.....	21½c. to 22½c.

Aluminum	
No. 1 aluminum (guaranteed over 99 per cent pure), ingots for remelting, per lb.....	30½c. to 31c.

Old Metals
The market is lower. Dealers' buying prices are as follows:

	Cents Per Lb.
Copper, heavy crucible.....	11.75
Copper, heavy wire.....	11.50
Copper, light bottoms.....	9.25
Brass, heavy.....	7.00
Brass, light.....	6.00
Heavy machine composition.....	8.75
No. 1 yellow brass turnings.....	8.50
No. 1 red brass or composition turnings.....	8.00
Lead, heavy.....	8.00
Lead, tea.....	6.00
Zinc.....	5.25
Cast aluminum.....	20.00
Sheet aluminum.....	20.00

